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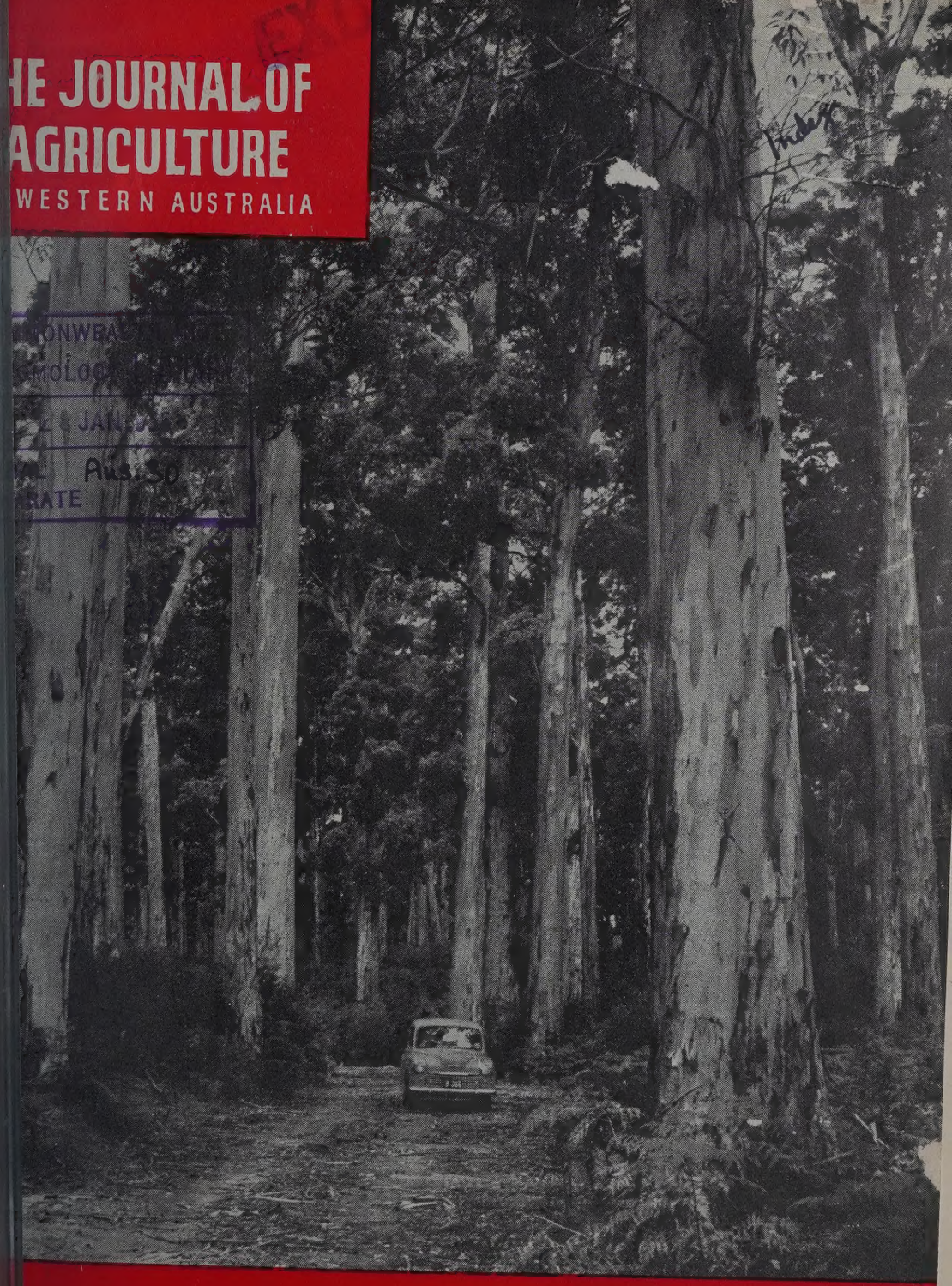

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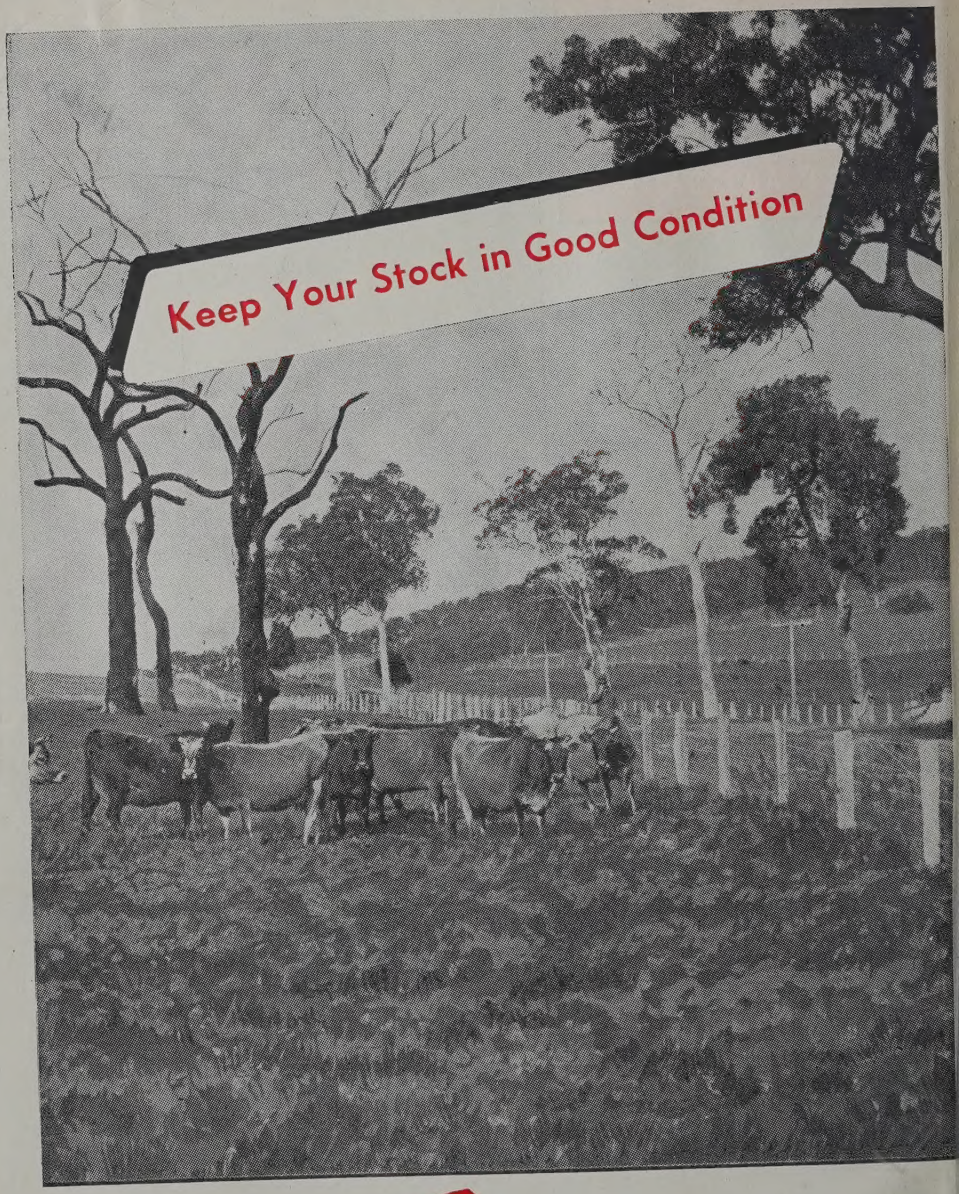

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COVER PICTURE

A road through the Karri forest near Pemberton. Karri (Eucalyptus diversicolor) is a magnificent tree growing up to 270 ft. in height and up to 10 ft. in basal diameter. It is restricted in habitat to the extreme South-West of Western Australia

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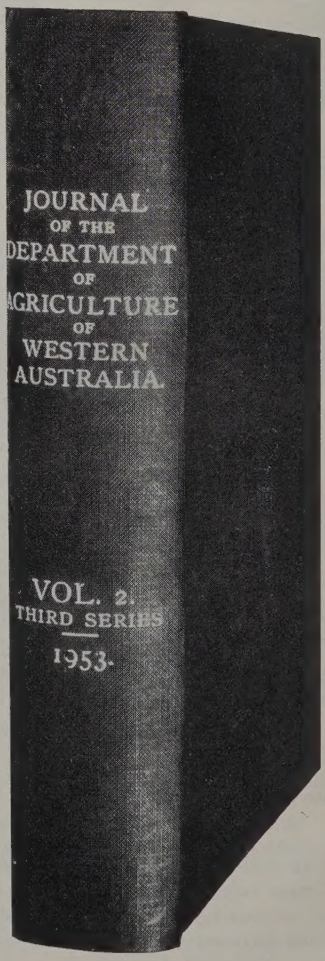


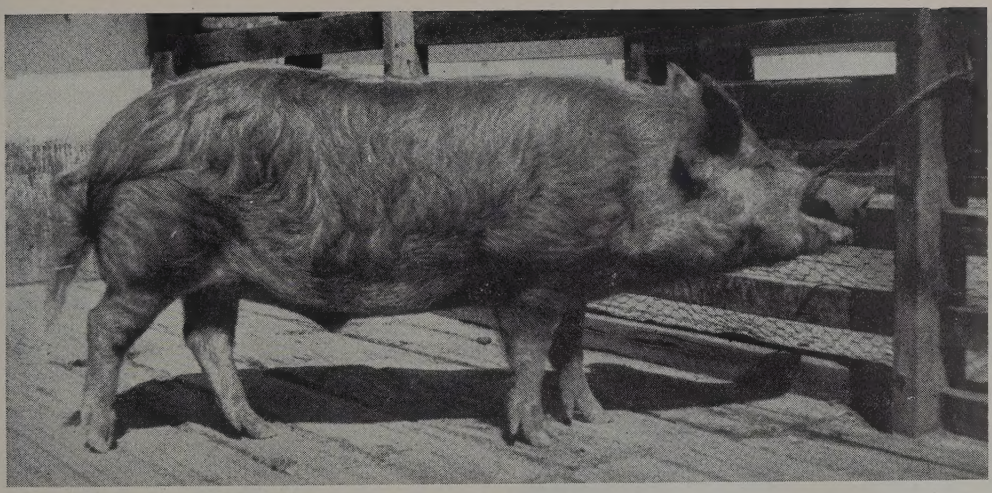


Fig. 1.—Boar secured with noose round upper jaw, behind the tusks.

THE DE-TUSKING OF BOARS

By P. GARSTONE, M.D.A., Pig Husbandy Instructor, Muresk Agricultural College

BOARS should always be regarded as potentially dangerous animals. Admittedly a well handled boar is usually docile, but it should always be remembered that the normally tractable animal is the one most likely to cause serious injuries if it does run amok. It is a wise precaution therefore to de-tusk all boars at regular intervals.

In its wild state a boar is an adversary which hunters and beasts of prey alike treat with marked respect. His razor-edged tusks, his courage, strength and lightning quickness make him one of the most dangerous wild animals in the world.

Boars of most domesticated breeds of pigs have inherited from their wild ancestors the possession of tusks which can inflict serious damage upon other pigs or upon human attendants. The tusks usually make their appearance when the animal is about nine months old and should be cut for the first time about three months later. Thereafter they need to be cut every four to six months. It is a good plan to shorten the tusks of even the quietest boar, and it is particularly important that boars should be de-tusked before being taken to a show or to the saleyards, as it is on such occasions that the animals are liable to become excited and become uncertain in their tempers.

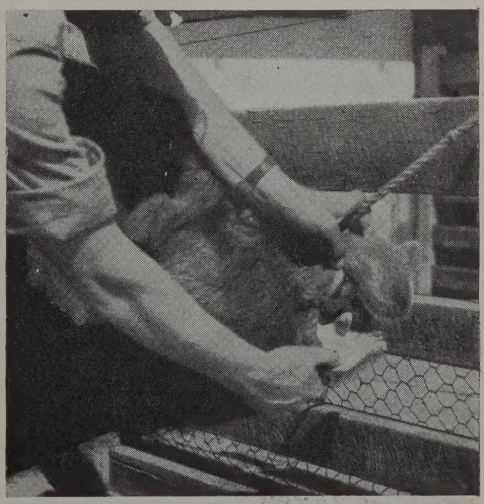


Fig. 2.—Showing tusks which have been cut back in previous years but are now ready for further attention.

Fig. 3.—Using a hacksaw to cut off the lower tusk.

Before commencing de-tusking, the boar should be restrained by placing a noose around the upper jaw behind the tusks and pulling it tight over the animal's snout. The rope should be sound and strong enough to hold the animal safely. The free end of the rope should be given two or three turns round a post or strong rail pulling it up short so that the animal is allowed very little free movement.

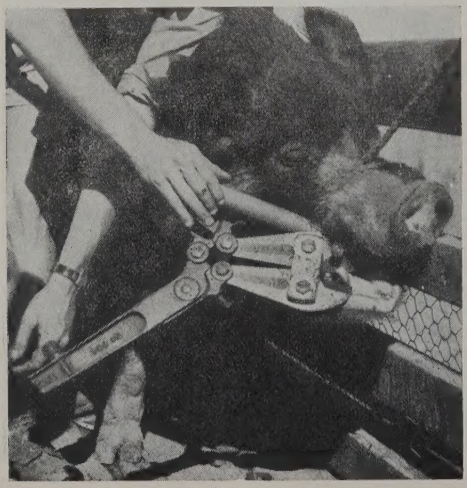
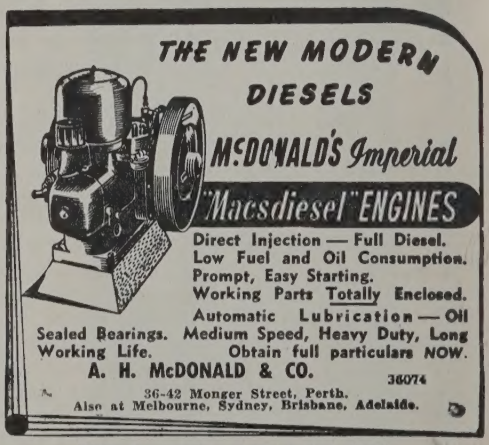


Fig. 4.—Bolt-cutters are sometimes used in detusking, but the hacksaw is preferable.

A tapered wooden gag placed in the boar's mouth is used to keep the jaws apart and prevent injury to the soft tissues when the cutting takes place. A suitable instrument for the operation is an ordinary hacksaw with a fairly coarse blade. This will cut through the tusks quickly and neatly and permit working very close to the gums.

An alternative method is to snip off the tusks level with the gums using bolt-cutters. This method is not recommended however, as the cutters are awkward to handle and usually break off the tooth, leaving a jagged edge which requires to be smoothed down with a rasp.



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DESTROYING THE PUPS

By A. R. TOMLINSON, Chief Vermin Control Officer, and C. K. BLAIR, Vermin Control Officer in Charge of Dogging Operations in Pastoral Areas

QUITE apart from the heavy financial losses caused in the sheep industry by the depredations of wild dogs (we use the term to cover both the true dingoes and various breeds of domesticated dogs running wild), the ghastly suffering which they cause should make every sheep-owner anxious to destroy these canine scourges wherever an opportunity offers. Wild dogs on killing sprees will maim and kill far more sheep than they can eat, but they cause the greatest suffering when teaching pups to kill. At such times, the adult dogs will disable sheep and leave them till the pups are brought up to inflict further suffering on the helpless victims. This process will be repeated again and again until the pups are able to make their own kills.

The pupping season, which normally extends from July to September, is a particularly favourable time to intensify the wild dog destruction campaign. The pups are most vulnerable at this season and have not yet been taught to kill. Furthermore, the parents may often be destroyed at the same time and the destruction of a family of wild dogs will pay good dividends.

FINDING THE "NESTS"

The finding of the lairs or "nests" requires knowledge of the habits of wild dogs, together with patience and tracking ability, but it is well worth the effort. From July to September, station hands should always carry rifles, poison and other equipment in readiness for use.

The nests may be in hollow logs, caves, along dry creek-beds, in crevices among rocks, in rabbit burrows or white ant mounds or in thick spinifex. They are usually within reasonable distance of water but seldom in such close proximity that the litters will be disturbed by stock or game.

When the pups are capable of leaving the nests they will often be found in suitable "hide-outs" near the lairs, or will move in closer to the water.

Indications of Pups in the Vicinity.

A freshly-killed carcass found between July and September, with big portions of the hindquarters or the shoulders eaten by one or two dogs, is a good indication that pups are being fed.

Dogs Return Direct to Pups.

The pups may be within a mile or even 15 to 20 miles away but, irrespective of pads, creek beds or soft travelling, the parents will return from the kill in the straightest line possible.

Behaviour of Parents While the Litters are in the Nest.

While the pups are still in the nest, the parent male dog will camp up to 200 yards away while the bitch will care for the litter. She will vomit up food for the

pups. The bitch will then go to where the male dog is located for his vomited contribution and take this also to the nest. After about a month, portions of the carcass are carried back for the pups to feed on.

Sometimes there will be two litters together in the same "nest" being cared for by the mothers (often an old bitch and a young bitch with the one male dog).

If the male dog's camp is found, the smaller tracks of the bitch will lead to the pups.

Parents Will Move the Pups if Disturbed.

If a hunter finds indications that he is in close proximity to a nest, he should make every effort to find it before nightfall. If he waits until morning, the parents are almost certain to have moved the pups any distance up to four or five miles. Alternatively, he should endeavour to destroy at least the bitch and if possible the male dog.

New Lairs Difficult to Locate.

Once a move has been made, it is extremely difficult to find the lair. Well-defined tracks lead to the original nest but, of course, the pups will be old enough to travel before the parents have time to make established pads to a new nest.

DESTROYING PUPS IN A NEST

In some cases destruction is easy as the nests may be readily accessible. In other cases they may be in caves with small openings, under rocks, in hollow logs and in other places difficult to deal with.

Poisoning.

Prepare some very small baits, impale on the end of a long pointed stick and push well into the den. A large poisoned bone can also be left just inside the opening. Barricade the entrance securely.

At some distance back along the pad leading to the den leave fairly large pieces of poisoned carcass. Traps can also be used to advantage if on hand. While the parents are in the vicinity endeavouring to rescue the litter, there is a good chance they will either be poisoned or trapped.

Wire Loop on a Pole.

A wire loop or hook on the end of a pole may be used as a probe to secure and pull out the pups.

Suffocating with Smoke.

Inflammable rubbish and wood should be inserted as far as possible and set alight after the entrance has been blocked. Green leaves will increase the smoke. If the lair is deep, the smoke will not penetrate sufficiently but the method is useful when everything else has failed.

DESTROYING THE PARENT DOGS

While the destruction of the pups will be a major achievement, it is important to destroy the parents or else the trouble will be repeated the following year.

Trapping.

Leave one of the pups in the nest and set two or three traps along the pad leading in. At the same time, set two or three traps in the vicinity of the male dog's hide-out.

However, under no circumstances should the nest be left unattended while obtaining traps. Almost invariably the pups or remaining pup will be removed by the parents before the hunter returns.

Poisoning.

Where the pups cannot be secured, poisoned baits should be inserted into the lair and carcass baits left for the parents as described earlier in this article.

Where the pups may be captured, leave one in the nest. Smear fat or blood behind the ears and under the flanks. Powdered strychnine should then be rubbed into these places. The bitch will return, remove the pup and will be poisoned when licking the fat or blood.

DESTROYING PUPS AFTER THEY HAVE LEFT THE NEST

The parents will make a kill some distance from the hide-out or bring back a portion of a carcass, leaving it some distance from the pups. The pups will be called to the meat and then be left to find their way back again. This procedure is part of the general training and teaches the pups to find their way about.

Tracks and Signs.

There will often be fairly well-defined tracks leading from the feeding place to the playground. It may be necessary to follow the tracks some distance before finding the playground, which is usually in thick scrub, heavy spinifex or among broken rocks in close proximity to water.

Caution and Careful Search Required.

Extreme caution and absolute silence are necessary in tracking or the pups will be frightened away.

If they have not been able to escape from the playground when it has been located, the pups will usually be motionless and well hidden even when the searcher is only a few feet distant. If one pup is found the others will be close by.

If Pups Cannot be Caught do not let them Escape in a Group.

Possibly the pups will be disturbed and be seen making off. Every effort should be made to split them up if they cannot be caught, otherwise they will not return to the same place.

After a litter of pups have been scattered, they will return to the playground and wait for the remainder prior to moving to another locality.

Poisoning of Pups after they Return.

Portions of a poisoned carcass should be scattered over the playground and left until the pups return. They will usually feed on the meat while waiting.

It is important that the hunter should move away from the vicinity for at least 24 hours. The parents may possibly be poisoned at the same time as the pups.

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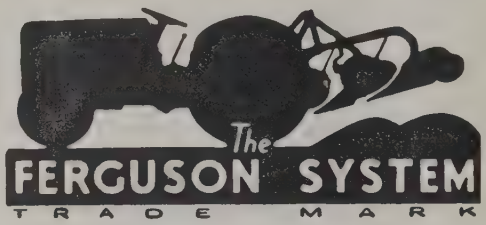

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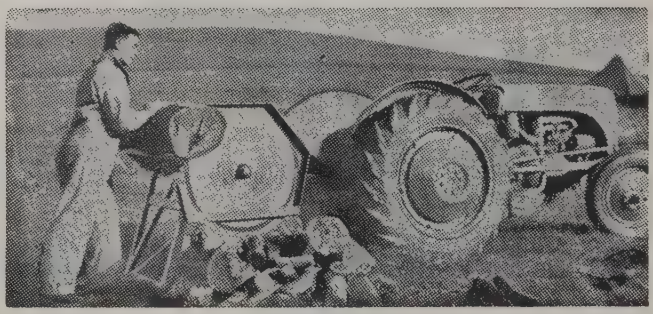

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PARK LAND CLEARING

By F. E. RYAN, B.Sc., Agric. (Hons.), Agrostologist

MODERN methods of land clearing have accelerated the development of virgin country in the higher rainfall, heavily timbered areas. These methods are still costly and involve a considerable outlay of capital by the individual farmer, both for clearing and developing these lands before they become productive.

A system of clearing the small trees and ring-barking the larger ones has been in operation for many years, but the dead timber standing in the paddock becomes a serious liability to further progress, because the falling limbs and trunks litter the paddock and a considerable amount of time and labour is needed to saw, burn or remove these as they fall.

In recent years, a method has been devised of bulldozing the small timber and low scrub using a light bulldozer and leaving a considerable number of the larger trees untouched. By this means an incomplete green canopy is retained at tree top level, but the floor is clean between the larger tree trunks. This permits the establishment of pasture and an increase in the productive area on the farm before the heavier costs of total clearing are needed. It has the further advantage that if the area is eventually totally cleared, the capital cost of development is spread over a period of time during which the area is producing pasture. Sometimes these areas are never fully cleared, but are left as park land areas capable of growing pastures without a high cost of clearing.

It is argued that trees, especially red gums, exert a beneficial effect in bringing plant nutrients, such as potash from the deeper soil horizons and deposit them on the surface of the soil as leaves which soon become available to pasture plants. It has been estimated that the amount of potash which can reach the surface layers in the soil in this way may be equivalent to as much as 48 lb. per acre per annum of muriate of potash.

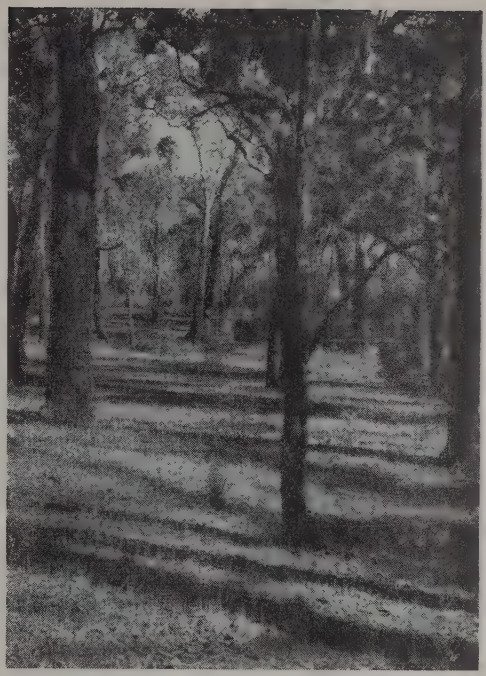

Fig. 1.—Mixed pasture growing among standing timber

On the other hand, in heavy rainfall areas, the removal of portion of the timber cover may cause a rise in the water table and this in turn will cause the green trees to die out as a result of waterlogging. If this happens, the farmer is still facing the difficulty of handling falling trees in the paddock.

THE NILLUP DEMONSTRATION

This method of park land clearing was demonstrated on Mr. V. Castle's property at Nillup during 1951-1953. An area of 16 acres, representing a number of soil types was selected and bulldozed to remove the lighter timber in January, 1951. A D.6 75 h.p. bulldozer was used as this was the only one available at the time, but a lighter bulldozer or even a dozer blade fitted to a farm tractor equipped with half-tracks would have been satisfactory for the work at a much lower cost. After bull-

dozing, the timber was windrowed and burnt. The cleaning up operations were carried out by Mr. Castle, using a power saw and farm tractor.

The area was cultivated by means of a tandem disc cultivator followed by pasture harrows. It was seeded down with the following seed mixture:—Tallarook subterranean clover 6 lb. per acre, Clunes perennial ryegrass 4 lb. per acre and Wimmera ryegrass 2 lb. per acre. The seed was covered by pasture harrows.

The 16 acres were fertilised with superphosphate at the rate of 2 cwt. per acre and the super was applied with a superspinner.

During the first year, 1951, germination after the May planting was very good. Seedling mortality occurred and by August is was estimated that 75 per cent. of the seedlings had died off for this reason.

Good growth of clover, however, occurred along the areas where the windrows had been burnt and also along the track immediately behind the super-spreader, but in between, poor results were obtained.

In 1952, the area was cross raked to spread the seed and some of the soil containing the nodule bacteria from the well grown strips was raked into the bare strips and the area was again fertilised with superphosphate at 2 cwt. per acre. Strips of lime at the rate of 5 cwt. per acre were put down across the whole paddock. As some sections retained soil moisture throughout the summer months, small areas were sown with Perennial White clover *(Trifolium repens)*.

During 1952, some improvement in growth occurred in the wetter sections. Tallarook subterranean clover persisted well and a thin stand of Wimmera ryegrass was obtained. Perennial White clover proved unsuccessful and only a very poor establishment of perennial ryegrass was obtained. A small amount of grazing only was obtained during that year and the animals did not appear to relish the herbage.

During 1953, Yarloop subterranean clover was sown over the whole area, but in that year a good germination of all species occurred. The area was fertilised with superphosphate and copper and zinc at the rate of 2 cwt. per acre and an excellent stand of Yarloop subterranean clover, Tallarook subterranean clover and Wimmera ryegrass was obtained. In the early part of the year, cattle did not find this pasture very palatable, but during the spring months, it was relished.

Heavy grazing for 70 cows was obtained during 1953 on the 16 acres of this area and it is pointed out that during the spring months, the animals relished this feed. During the spring of 1953, excellent pasture of subterranean clover and ryegrass was obtained.

During the autumn of 1954, excellent germination was again obtained and no difficulty was experienced in getting the stock to eat the fodder. During the early autumn months, 25 cows were grazed for two hours per day in a period of six weeks on the 16 acres. This is showing excellent pasture growth for 1954 and it is anticipated that very good results will be obtained during the year. The pasture is now well established and vigorous.

Fig. 2.—A good stand of clover among redgums

It was suspected that when areas such as this are cleared the rise in the water table would cause the death of a number

of the standing trees. A number of the trees left on this demonstration subsequently died and the area became waterlogged during the winter months, but it was noticeable that similar tree deaths occurred on the surrounding area and that the proportion of trees which died was not greater on the demonstrational area than beyond it.

Over the three year period, the cost of developing a strong pasture on this 16 acres of land has been £257 or approximately £16 per acre. This cost has been incurred over the three year period as follows:—

	£	s.	d.
Bulldozing	119	0	0
Fertiliser—			
1951, Super 32 cwt.	30	0	0
1952, Super 16 bags	24	19	8
1953, Super + copper + zinc 16 bags	21	19	6
Seed—			
Tallarook subterranean clover 96 lb.	39	1	0
Yarloop subterranean clover 50 lb.	9	1	3
Clunes perennial ryegrass 64 lb.	9	18	6
Wimmera ryegrass 32 lb.	3	1	6
Total	257	1	5

All costs are calculated on present day prices for seed and fertiliser delivered at Karridale.

The main annual outlay on this pasture for a number of years will be in the cost of applications of superphosphate and the demonstration has shown very clearly that substantial areas can be brought into production at a relatively low cost.

DEVELOPING NEW AREAS

The costs outlined in the above table represent the outlay necessary to bring this area under production and do not include the labour contributed by Mr. Castle in burning up bulldozed logs or in his use of the power saw for subsequent cleaning up, but they do represent the out of pocket expenditure necessary to develop an area along these lines.

The demonstration has shown a method by which farmers may increase their areas of pasture with a moderate capital outlay. Considerable uncleared areas of similar country occur in the Karridale region and this demonstration shows one method of developing this land.

No improvement following the use of lime was recorded in this demonstration and also the establishment of perennial ryegrass and Perennial White clover was very poor. It is recommended that for the initial stages of establishment of a parkland area such as this, a simple mixture consisting of Tallarook subterranean clover 3 lb., Yarloop subterranean clover 3 lb. and Wimmera ryegrass 4lb. per acre should be used and this fertilised with copper, zinc, super at the rate of 2 cwt. per acre.

The development of seedling mortality in the first year of newly cleared land is well known in many areas in the South-West. This affects fully cleared as well as parkland cleared areas and usually a period of 12 months fallow after the original discing is recommended to overcome this. Where 12 months fallow period is adopted, the area should be re-cultivated in the second year before being sown down.

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Do you know that the Department of Agriculture provides a comprehensive service of advice and technical assistance to farmers, free of charge?

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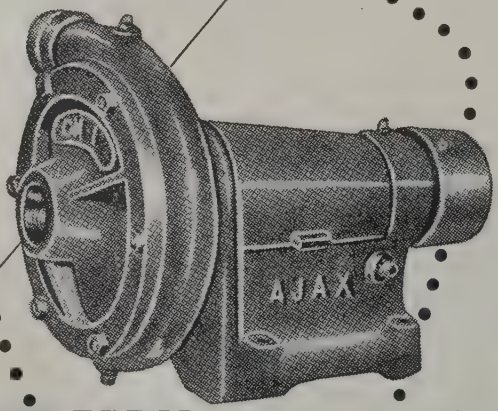

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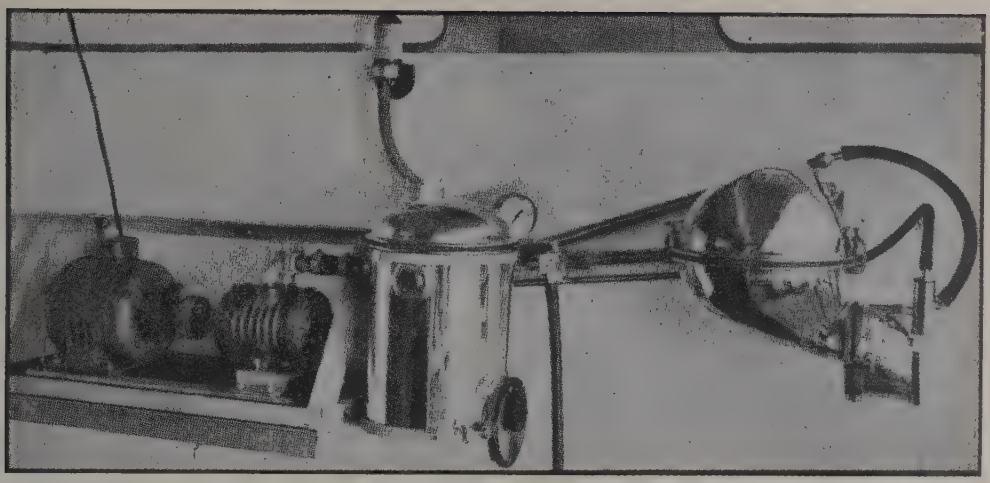


Fig. 1.—The machine in the releaser room. The whole assembly is mounted on two brackets. The releaser with its pulsator is on the right; the recycling valve and cleaner inlet can be seen between releaser and vacuum tank. The master pulsator is partly visible above the vacuum tank lid. The vacuum tank has a fitting to take the releaser split-chamber for automatic cleaning.

MILKING MACHINE DEVELOPMENT

AT a recent conference at Ruakura in New Zealand, a milking machine embracing many new developments was on view and proved a great attraction. This machine is the outcome of 15 years' research by Dr. W. G. Whittlestone and Mr. D. S. Miller, both of the Ruakura Animal Research Station at Hamilton, New Zealand.

Dr. Whittlestone has an international reputation for milking machine theory and design. Mr. Miller is a leading physicist in New Zealand and has made many of the outstanding features of this machine possible. Never has so much time and research been put into any one machine of this type. From the inception of the project it became a major problem of engineering research.

The Ruakura milking machine has been designed to meet three important essential requirements in mechanical milking.

(1) To provide a simple trouble-free mechanical system which requires little maintenance and very rarely gets out of adjustment.

(2) To provide the stability of vacuum level and regularity of pulsator action necessary to the cow if "let down" response is to be consistently good.

(3) To incorporate a cleaning system which can maintain the machine in a satisfactory state of hygiene at all times.

The machine as developed at Ruakura has several outstanding features. It has a new type of releaser, an improved milking claw which is streamlined and incorporates an automatic cut-off, leak-proof couplings and an automatic recirculating system which makes the machine virtually self-cleaning.

The latter idea will be appreciated by all dairy farmers because of the saving of time in cleansing the machine.

The machine is supplied to the farmer in such a way as to render the services of a qualified fitter unnecessary, the farmer being able to instal the machine in his own dairy, thereby saving in installation cost.

The machine of which we have advice is an electric motor driven model.

GENERAL DESIGN

The machine has been designed so that all parts requiring precision fitting are pre-assembled during manufacture. The machine is supplied to dairy farmers as a series of units premounted ready for installation.

Unit 1.

Consists of vacuum pump, motor, vacuum tank and master pulsator unit.

These are combined on a welded metal frame which is attached to the wall of the dairy by 6 bolts; no other fitting is needed.

This type uses direct drive coupled to pump as a safety advantage.

Unit 2.

Is the releaser and releaser pulsator unit.

This is again mounted on a single bracket bolted to the wall of the dairy.

The whole releaser is removable, top and bottom portions of the releaser are identical in shape thereby allowing for economy in manufacture.

Unit 3.

Bail mountings. These consist of a sliding mount in each bail mounted on an adjustable steel cross bar. All pipes and pulsators slide into position in these mountings and require no fitting.

The same mounting fits left or right hand sheds.

Unit 4.

Stainless steel pipe is used with a new type of leak proof coupling in each bail length. This ensures an efficient and hygienic vacuum seal. Couplings are supplied fitted to one end of the pipe length, the free end being available for cutting to precise length as required for each shed.

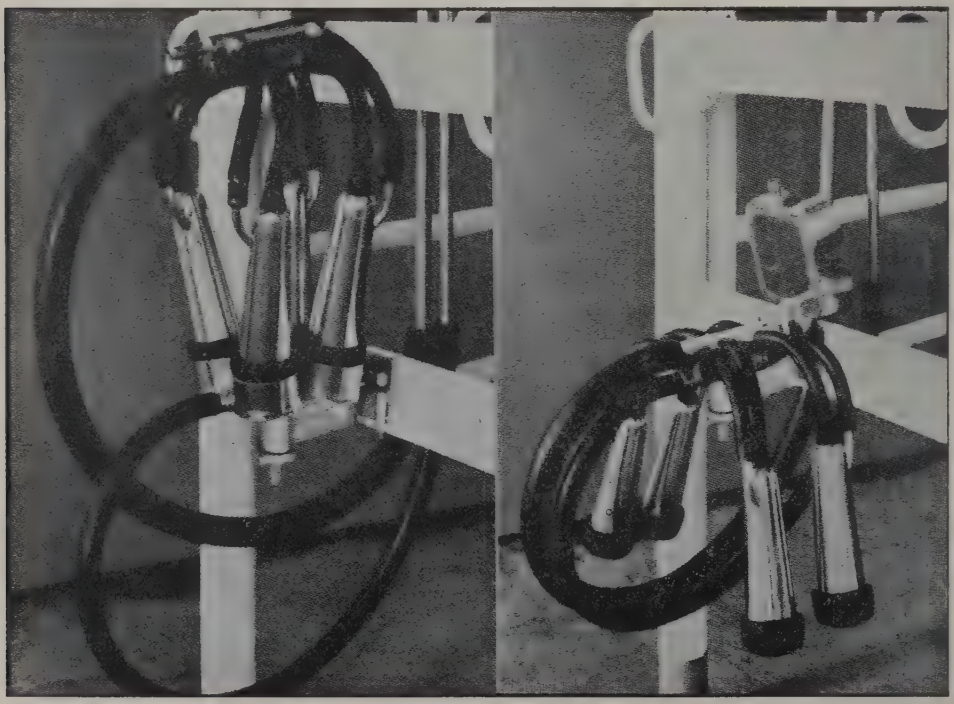


Fig. 2.—Left: The teat-cups fitted into the jetting device so that detergent solution passing down the pulsator dropper will flow through the cups and claws in its circulation throughout the plant. Right: The teat-cups hung up in the automatic cut-off position on the claw-hook which is available when the jetting device is pushed to the vertical position. The improved claw and teat-cup design can also be seen.

Milk nozzles and pulsator are mounted during manufacture so that the only shed fitting needed is the cutting to length of the pipes to fit the bails.

PULSATOR SYSTEM

The pulsator system operates entirely from the vacuum system employing no mechanical drives. It is controlled by a vacuum-operated automatic master pulsator which provides operating force for the releasor and bail pulsators.

The use of this vacuum system eliminates the possibility of mis-alignment and loss of adjustment in pulsators due to movement of supporting members in the shed, also the chance of faulty installation is minimised by this system.

Master Pulsator.

This is a self-contained unit and is isolated from the rest of the system to eliminate contamination by milk or water.

The master pulsator is a timing pulsator and its function is to provide accurate rate and ratio for the operation of the bail pulsators and releaser.

This is a key feature because all pulsators of the plant maintain identical performance under master pulsator control.

The unit requires no oiling or maintenance.

Air filtration is also a feature of the machine enabling the machine to operate on screened air free from dust, etc.

Releaser Pulsator.

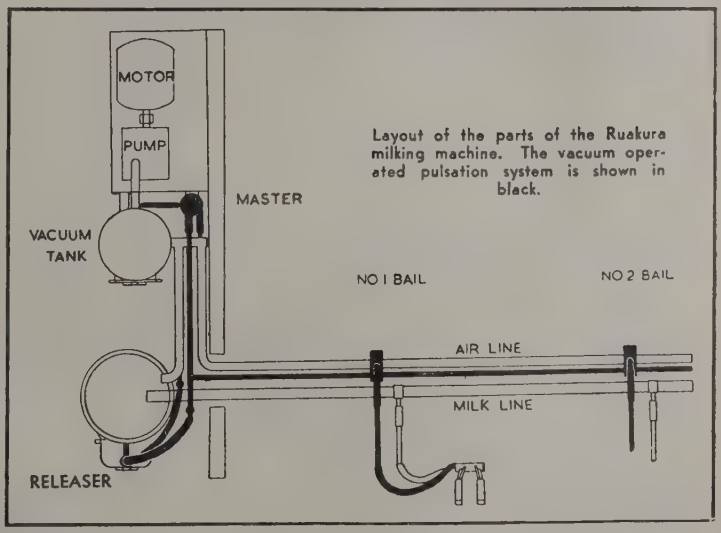
This is a small sleeve-type pulsator in which the plunger is made to operate in both directions by the master pulsator. The metal plunger is the only part that moves and requires no lubrication. It is mounted directly on the releaser spit chamber so that all air flow paths are as short as possible. This gives optimum condition for the operation of the releaser and eliminates releaser flooding which makes for poor milking and contamination of the air line with milk. In addition the use of the releaser pulsator enables the releaser to work at greater milk capacity than is normally possible.

Bail Pulsators.

These are almost identical with the releaser pulsator. No lubrication is necessary.

As in the case of the releaser pulsator, the vacuum system of operation makes it possible for cleaning solutions to be passed through it so that complete circulation of cleaning solutions throughout the machine is possible.

RUAKURA MILKING MACHINE



Layout of the parts of the Ruakura milking machine. The vacuum operated pulsation system is shown in black.

Special Features.

The claw has been designed with as few cavities and corners as possible. Nozzles are arranged so that all claw tubes butt against a metal surface leaving no corners for the collection of dirt and fat.

The claw has also been designed with an automatic cut-off so that folding over of the claw tubes is unnecessary when cups are being placed on the teats. The cut-off eliminates the loss of vacuum should one or all of the teat cups fall off the cow.

Sight Glasses.

Incorporated in the system at each bail is the Ruakura milk flow indicator which shows definite milk-out time and which is used to time the milking process of individual cows.

Vacuum Control.

The Ruakura vacuum regulator is used to provide efficient vacuum control.

This is a device which has become almost standard on all New Zealand milking machines.

Rubber Ware.

All parts of the plant are subjected to differing conditions during the process of milking and in this machine the rubber ware has been given special attention because of this. The new rubber ware has been designed to provide the best available material at each point for each specific job.

Inflations are made of part nitrile carbon rubber which has the advantage of being very flexible and yet low fat absorbing.

The tubing of the claw, milk and air tubes is made from natural rubber reinforced with carbon black which combination makes for toughness and wear resisting. All other rubber has been designed for its specific qualities to cope with the work required.

It has been the general aim in the specifications for rubber ware on the machine that no components should have to be replaced during the working season.

Cleaning System.

An automatic cleaning system is one of the high lights of the machine.

This is made possible by the use of vacuum pulsation and the installation of a recirculating valve of special design which enables the recirculation of cleaning liquids to occur.

The Cleaning System is made up of.

(a) A special two way valve in the air line to the vacuum tank.

(b) An attachment on the vacuum tank to which the Spit Chamber of the Releaser is attached during recirculation of liquid for cleansing.

(c) A jetting device in each bail to which the teat cups are attached to permit complete recirculation cleansing.

Method of Operation.

First the normal method of rinsing through the plant is carried out at the completion of milking. The teat cups are then connected to the jetting device. The Releaser Spit Chamber is then transferred to the vacuum tank connection. A bucket of hot cleaning solution is drawn into the machine through a tube attached to the recirculation valve when this is placed in the operating position.

The hot solution reaches the teat cup surfaces at maximum temperature and with a great amount of turbulence, cleaning the pulsators as it goes. It then fills the milk line and releaser giving the whole milk system a thorough soaking at high temperature.

The cleansing system being automatic, once the detergent is placed in the container supplying the plant it is practical to subject the plant to prolonged cleaning without any additional work by the operator.

While the automatic cleansing of the plant is being carried out, the external parts of the machine can be scrubbed and cleansed, thereby saving considerable time.

It is felt that with the system of automatic cleansing which has been designed as an integral part of the machine many of the milking machine defects in cream and milk will be done away with and it will lead to lower bacteria counts in these products, to the benefit of the dairy farmer and the community generally.

It is understood that no patents have been taken out on this machine nor is it intended to do so, so there is no restriction on its being manufactured in Australia and it may appear on the market shortly.

The designer and those who carried out the research work in New Zealand are to be commended on their effort.

(Summary prepared by H. M. Lister.)

TANK INDICATOR GAUGE

A Novel and Effective Design

A MOULYINNING farmer, Mr. K. M. Atkins, has forwarded details of an attractive and effective gauge to indicate the level of water in an overhead tank. He used a length of transparent plastic piping to make a gauge that is positive in action, easy to read and pleasing in appearance:

Mr. Atkins writes:—"Some time ago I noticed your replies to a Journal reader who asked for advice on constructing an indicator to show the level of water in an overhead tank. The indicator on my tank is my own brainchild and it might interest others.

"Most of the tank indicators in use are of the type you illustrated and consist of a float and pulley with the indicator itself working in reverse—in other words the indicator falls as the water-level rises. The gauge I made shows the actual level of the water in the tank on an outside indicator and has no pulley or other gadgets to get out of order.

"Our soak water, although it is crystal-clear and excellent for either drinking or washing purposes, is apt to corrode metal pipes in about 10 years, so I decided to use rigid transparent plastic piping underground from the mill to the tank at the house about 700 yards away. After the installation was completed I had a length of about 6ft. of the 1in. plastic piping left and decided to use it as a tank gauge.

"My 1,000-gallon tank, which I put up on a 10ft. stand, had originally done duty as a rainwater tank and was fitted with a ¾in. tap.

"I removed the tap and screwed in a ¾in. M and M elbow bend in its place. To this I screwed a ¾in. to 1in. socket to take a plastic screwed connector and the 6ft. of plastic piping.

"The piping was in a vertical position and this meant that when water was pumped into the tank it would rise also to the same level in the pipe outside the tank.

"Next I obtained a cork that would fit easily into the pipe, weighted it with a blob of solder so that it would float upright, and painted it bright red. This was dropped into the pipe to serve as an indicator and it is clearly visible at a long distance from the tank.

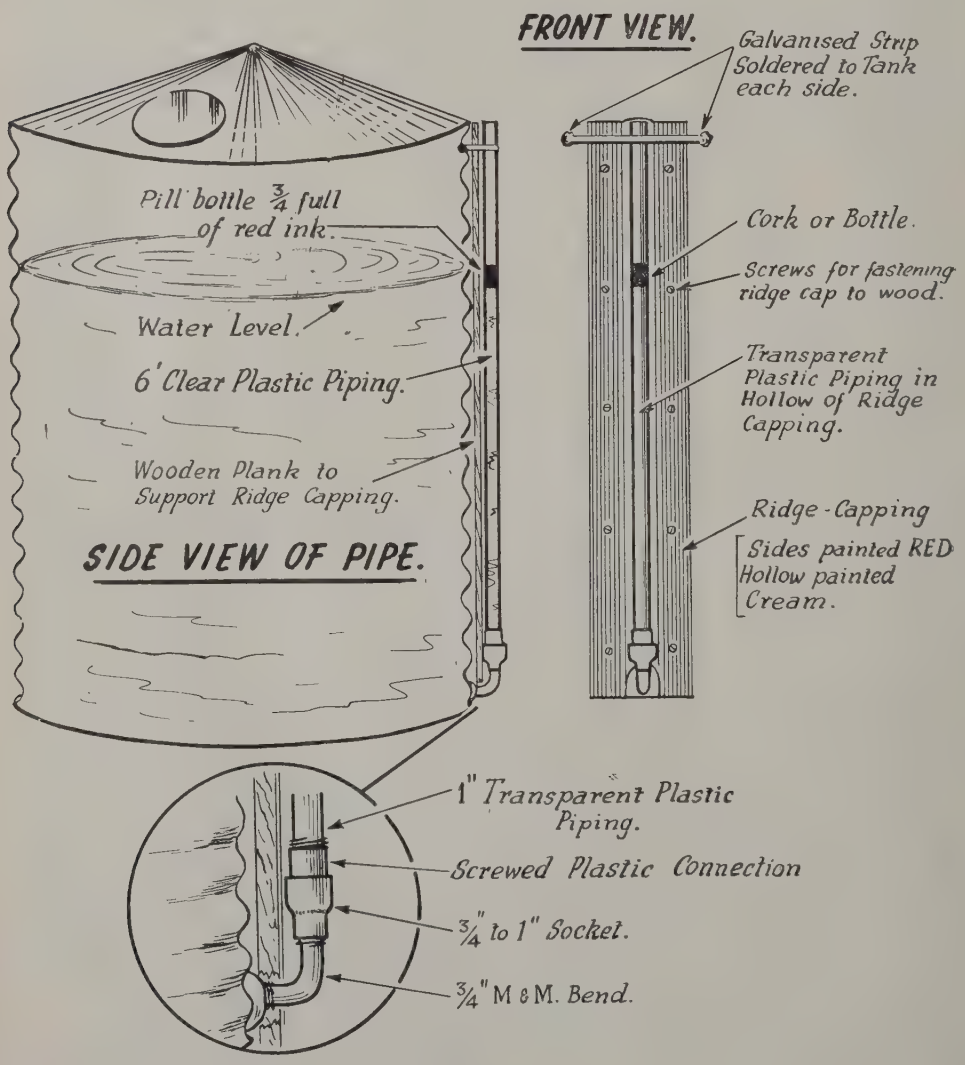
"Probably a better float could be made from one of those long narrow pill-bottles of suitable diameter, partly filled with red ink or red enamel and then tightly corked and sealed with waterproof cement.

"To finish off the gauge I obtained a length of galvanised iron ridge-capping, cut a notch out of the bottom so that it fitted snugly over the elbow bend and screwed two lengths of 2in. x 1in. jarrah to the back of the two flat portions of the ridge-capping to give extra rigidity.

"The inside of the groove in the ridge-capping was painted cream, and the flat portions given two coats of pillar-box red.

"The ridge-capping was then slid into position behind the plastic piping which fitted snugly into the cream-painted groove. The flat portions were pressed back against the tank. A ½in. strip of 24-gauge galvanised iron was soldered to the tank at each end so that it crossed over the front of the ridge-capping holding the whole thing rigidly in position and holding the plastic piping in the groove.

"The red cork shows up plainly against the cream background and the assembly has now been in position for four years and is giving excellent service."


FRONT VIEW.
Galvanised Strip Soldered to Tank each side.
Cork or Bottle.
Screws for fastening ridge cap to wood.
Transparent Plastic Piping in Hollow of Ridge Capping.
Ridge-Capping
Sides painted RED
Hollow painted Cream.
Pill bottle ¾ full of red ink.
Water Level.
6' Clear Plastic Piping.
Wooden Plank to Support Ridge Capping.
SIDE VIEW OF PIPE.
1" Transparent Plastic Piping.
Screwed Plastic Connection
¾" to 1" Socket.
¾" M & M. Bend.

INSECT Pests AND THEIR CONTROL

By C. F. H. JENKINS, M.A., Government Entomologist

FLEAS AND THEIR CONTROL

EVERY year, with the advent of warm weather, trouble is experienced from what are popularly known as "sand fleas." The fallacy of this name, however, cannot be too firmly stressed, for all fleas favour a warm-blooded host and are quite incapable of surviving and reproducing in sand without periodic supplies of blood from a suitable animal.

There are many different species of fleas and they are commonly known according to the host which they favour, as dog fleas, cat fleas, rat fleas, human fleas, mouse fleas, etc. It must not be inferred, however, that every flea found upon a dog is a dog flea, or upon a rat is a rat flea. A great deal of latitude as regards hosts exists and only a specialist can accurately determine the species. Excepting in special cases, however, the exact species of flea concerned will be of little importance.

Fleas are admirably adapted for their specialised mode of life. Their shiny compressed forms slip easily between the hairs on the host body, and their well-developed jumping legs enable them to easily obtain a host immediately their immature stages in the soil have been completed.

Fig. 2.—Adult male of the human flea. Note difference in shape of abdomen as compared with Fig. 1 (greatly enlarged

—After Howard.

Fig. 1.—Adult female of the human flea (greatly enlarged)

—After Howard.

In metropolitan homes, cats and dogs are the chief breeders of fleas. The fact that outbreaks occur in dwellings where no pets are kept can sometimes be explained by the fact that the previous occupants kept animals and that the immature stages of the fleas have persisted in the soil or in cracks and crevices of the floor until weather conditions have favoured the

emergence of the adults. The introduction of animal manures for garden purposes is also a source of flea infestation which should not be overlooked.

Under favourable conditions, the adult flea may live for a considerable time. There are records of a human flea, fed regularly, living for 513 days and one of a performing flea living for 18 months. Dog fleas have been known to live 58 days without feeding. One remarkable adaptation which enables the insect to tide over unfavourable periods also accounts for the sudden appearance of a flea plague in abandoned houses or camp buildings. The adult flea when it first emerges from the pupa may remain motionless within its thin silky cocoon for a period of a year or more. When the cocoons are prodded or shaken the fleas emerge at once and commence jumping about with great activity.

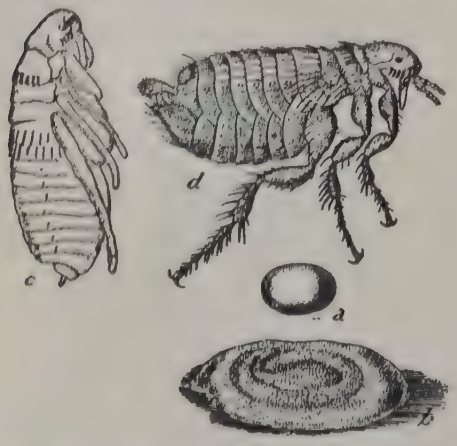


Fig. 3.—The dog flea: (a) egg; (b) larva in cocoon; (c) pupa; (d) adult. All greatly enlarged

After Howard.

RELATION TO DISEASE

The rat flea *(Xenopsylla cheopis* (Roth.)) is of world-wide importance because of its association with bubonic plague, but a number of other fleas including the dog flea *(Ctenocephalides canis* (Curtis)), the cat flea *(C. felis* (Bouche)), and the human flea *(Pulex irritans L.)* have been proved capable of carrying this disease.

All these species and many others occur in Western Australia, but fortunately bubonic plague is a rare disease throughout the Australian Commonwealth. Several outbreaks of plague have occurred in Australia, but all have been successfully stamped out, and very stringent precautions are continually taken to prevent the introduction of infected rats, from which animals the fleas may transmit the disease to humans. (Patton, 1931.)

LIFE HISTORY

Adult fleas spend the majority of their time on warm blooded hosts and may lay their eggs in this situation. Flea-infested cats for instance may have so many eggs in their fur that hundreds of the tiny pearl-like bodies are shed wherever the cat happens to scratch or shake itself. In the case of most other host animals, the majority of eggs are found in the nest or favourite sleeping quarters. The eggs hatch in a few days and give rise to tiny worm-like larvae which shelter in any dust or litter. The food consists of organic material, mainly the excreta of adult fleas which is dropped copiously and becomes mixed with the dust or floor covering. After a week or more the larva pupates within a silken cocoon and finally emerges as an adult. As is the case with all insects, the length of the life cycle varies greatly under different conditions. In warm weather little more than two weeks will be necessary for development from egg to adult, while under cold conditions several weeks or even months may elapse before maturity is reached.

CONTROL

In controlling fleas the first essential is to locate the host animals which will usually prove to be cats, dogs or rats. After treating or destroying the hosts, the infested premises can then be satisfactorily treated.

The new insecticides such as DDT, BHC and Chlordane have all proved very effective against fleas and they may be used as dusts or sprays for the treating of infested sheds, yards or houses. DDT has been widely recommended and a 10 per cent. dust sprinkled at the rate of 1 lb. per 500 square feet of floor space is prescribed for indoors. The dust should be left in place for at least one day after which it may be taken up with a vacuum cleaner (Anon, 1952). Sprays containing

4 per cent. DDT may also be used either for indoors or outhouses at the rate of 1 pint per 100 square feet (Seddon, 1951). Kerosene solutions of DDT will prove most suitable for indoor use, as they can be applied to carpets, skirting boards, etc., without staining. Water-miscible types, however, will be found more economical for sheds, yards, and other outdoor situations. Water-dispersible DDT and BHC powders may be used for washing animals (except cats) but emulsions are not advised as the solvents may prove irritating to the skin. The strengths recommended are 0.5 per cent. DDT and 0.1 per cent. gamma isomer of BHC. Ten per cent. dusts may also be used to rub into the animals' fur, but dusts remain effective for shorter periods than washes. As cats frequently lick their fur, DDT and BHC may prove toxic, and pyrethrum and derris powders should be rubbed into the fur. Potassa sulphurata may also be used as a wash.

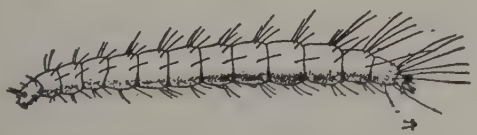


Fig. 4.—Flea Larva (greatly enlarged)

One of the older treatments for fleas which still appeals to many people is kerosene emulsion. It may be used for universal spraying and also for washing animals. It may be prepared as follows:—

Dissolve ½ lb. soap in 1 gallon of boiling water. Remove from fire and slowly add 2 gallons of kerosene, at the same time vigorously agitating the solution for 5 or 10 minutes so as to get a thorough mix. Dilute for general use to about 1 part of stock to 6-8 parts of water. Warm water and constant agitation during the dilution process will ensure a stable mixture.

Phenyle, hot water and soap, creosote or creosote emulsion may also be used to treat infested buildings. Creosote emulsion may be prepared by substituting creosote for kerosene in the details given for the preparation of kerosene emulsion.

The main essential is to see that corners, cracks and crevices are well flushed out with liquid.

REFERENCES

Anon, 1952. "Household Insect Pests and Their Control." 3rd Edition. New South Wales Department of Agriculture. Insect Pest Leaflet No. 47, p. 24.

Patton, 1931. "Insects, Ticks, Mites and Venomous Animals of Medical and Veterinary Importance." Pt. II, p. 247.

Seddon, H. R., 1951. "Diseases of Domestic Animals in Australia." Part 2. Commonwealth of Australia. Department of Health Service Publication (Division of Veterinary Hygiene) No. 6.

KEEP YOUR JOURNALS

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THE EFFECTIVENESS OF 2,4-D IN PREVENTING PRE-HARVEST DROP OF NAVEL ORANGES

APPLICATIONS AT DIFFERENT CONCENTRATIONS AND IN COMBINATION WITH BORDEAUX MIXTURE

By N. J. HALSE, B.Sc. (Agric.) Research Officer.

AN experiment was carried out to test the suitability of combining a 2,4-D hormone spray, to prevent mature fruit drop of Navel oranges, with a routine fungicidal spray of Bordeaux mixture. The hormone was tested at two concentrations. The results of the experiment indicated that under the conditions tested the 2,4-D spray could not be successfully combined with Bordeaux mixture and the concentration of 20 parts per million was superior to 10 parts per million. The lower concentration may be equally effective with a high rate of spray application.

In a previous investigation carried out in this State (1) into the pre harvest drop of Navel oranges it was found that the 2,4-D spray to reduce the drop was effective when combined with a copper oxychloride fungicidal spray. This agreed with Californian work (2) where the hormone was found to be compatible with copper sprays. However, in the previous investigation in this State the fall of mature fruit was not heavy on any treatment so the hormone was not severely tested and the hormone spray was not combined with Bordeaux mixture. Following work done in New Zealand (3) where the presence of copper reduced the effectiveness of the hormone spray it was decided to carry out a further investigation under local conditions.

SITE

The experiment was carried out on the property of Mr. N. Fox, South Chittering. The trees were healthy Washington Navel oranges carrying a good crop. A few weeks prior to the commencement of the experiment all trees were sprayed with Bordeaux mixture.

EXPERIMENTAL DETAILS

Five treatments were included in the experiment.

A.—No spray.

B.—Sprayed with 10 parts per million 2,4-D.

C.—Sprayed with 10 parts per million 2,4-D + Bordeaux.

D.—Sprayed with 20 parts per million 2,4-D.

E.—Sprayed with 20 parts per million 2,4-D + Bordeaux.

The sprays were applied from a power spray at the rate of two gallons per tree on June 12. The ethyl ester of 2,4-D was used and spray concentration is given as the ester not as free acid equivalent.

The experiment was laid out on a latin square design with four trees in each plot. This meant there were 20 trees in each treatment.

From June 18 until the fruit was harvested the oranges were picked up and counted from beneath the trees at approximately weekly intervals. They were divided into sound and unsound fruit; the latter category included split oranges and oranges attacked by fungi which had caused them to fall from the tree.

Harvesting was commenced on August 13. The fruit from all the trees was picked and counted by August 20.

The progressive increase in numbers of sound fruit falling from the trees is shown in Table 1. It can be seen that particularly in the treatments from which the drop

was heavy there was a reduction in the rate of drop in the last few weeks of the experimental period.

Table 1.

Total number of sound fruit below trees.

Date	A	B	C	D	E
June, 18	38	22	15	10	13
June, 24	89	28	42	15	69
July, 1	231	111	197	53	190
July, 8	243	109	217	37	122
July, 15	561	264	468	120	235
July, 23	689	336	663	159	339
July, 30	632	320	709	194	399
Aug., 6	585	316	661	227	406
Aug., 12	489	284	444	197	326
Total	3,557	1,790	3,416	1,012	2,099

The average number of fallen fruit per tree and the percentage of the original crop at the beginning of the trial period that this represents are shown in Table 2. The difference in ratios between the two sets of figures is due to the differences between the original numbers of fruit on the trees at the commencement of the trial period.

Table 2.

Sound fruit fallen.

	Average number per tree	Average percentage of crop
A.—No spray	178	23.7
B.—2,4-D at 10 ppm	89.5	15.7
C.—2,4-D at 10 ppm + Bordeaux	171	20.4
D.—2,4-D at 20 ppm	50.5	8.3
E.—2,4-D at 20 ppm + Bordeaux	105	16.5

Least significant difference at 5% level = 52.7

Least significant difference at 1% level = 70.2

The difference between the two concentrations of 2,4-D and the effect of combining the hormone spray with Bordeaux mixture are shown in table 3.

Table 3.

Average No. fruit fallen from tree.	
2,4-D spray (average treatments B and D)	70
2,4-D spray + Bordeaux (average of treatments C and E)	138
Difference significant at 1% level.	
2,4-D at 10 ppm (average of treatments B and C)	130
2,4-D at 20 ppm (average of treatments D and E)	78
Difference significant at 5% level.	

As well as the sound fruit, counts were made of the unsound fruit fallen from the trees. The average number per tree varied from 15 to 25 in different treatments, but there were no significant differences between the treatments.

DISCUSSION OF RESULTS

An examination of the weekly counts of sound fallen fruit in Table 1 shows that the difference between treatments showed up almost immediately at the commencement of the trial and was maintained until the end of the trial period. This suggests that the effect of the spray will last for at least two months under local conditions. It is not likely that any benefit would be derived from applying the spray much earlier than June as the number of sound fruit falling at this time was very low.

As can be seen in Table 3 the effect of applying the 2,4-D in combination with Bordeaux mixture was to cause an increased fruit drop compared with the treatment with the same hormone strength applied without Bordeaux. It seems likely that the Bordeaux has a detrimental effect on the hormone but further work is necessary to establish this as the reason for the observed effect.

Table 3 also shows the difference between the two concentrations of spray. The higher concentration of 20 ppm was more effective in reducing fruit drop than the lower concentration. The most effective concentration is probably related to the volume of spray applied to the trees. In this experiment the trees, which were well-grown, were sprayed with two gallons per tree. If a greater volume of spray had

been used the difference between concentrations might not have shown up. This has been the experience in other orchards where no increased benefit has been obtained from higher concentrations than 8 ppm, but the volume of spray applied was over 500 gallons per acre.

REFERENCES

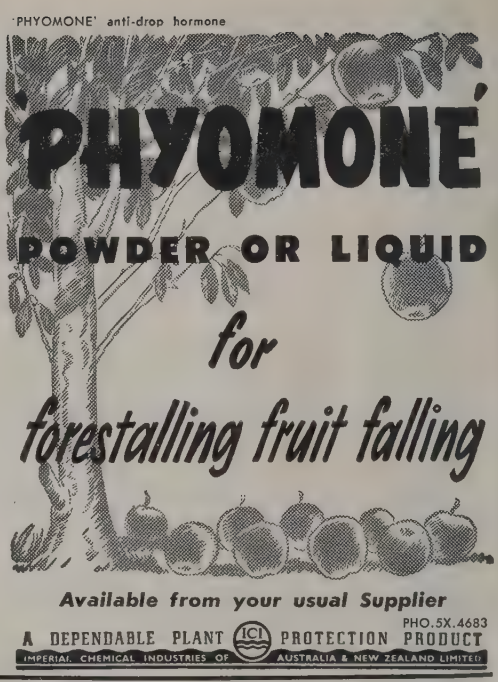
(1) Halse, N. J., Journal of Agric. W.A. Vol. 1, No. 3 (1952).

(2) Erickson, L. E. and B. L. Brannaman, Calif. Citrograph, Vol. 36, No. 2 (1950).

(3) Davison, R. M., N.Z. Jour. of Science and Technology, Vol. 34, No. 4.

ACKNOWLEDGMENTS

Grateful acknowledgment is made to Mr. N. Fox for the use of his orchard and his assistance in carrying out the work and to the various members of the Department of Agriculture who assisted throughout the trial.



FODDER TREES

A BOOKLET issued by the Imperial Bureau of Pastures and Field Crops, Aberystweth, commences with the following sentence, "It is a humbling fact for grass pasture experts to realise that probably more animals feed on shrubs and trees, or on associations in which shrubs and trees play an important part, than on true grass or grass-legume pastures . . . ."

Major H. A. Corbet, formerly Deputy Master of the Royal Mint in Perth, and a well-known writer and broadcaster on horticultural topics, has long urged Australians to pay greater attention to the preservation of the many native trees and shrubs which provide nutritious and palatable "top feed" in many of our arid and semi-arid areas.

He asks, "Shall we treat this fodder as a wasting asset to be exploited until exhausted, or shall it be recognised as an estate to be conserved and developed?"

In his pamphlet entitled "Fodder Trees," a second edition of which was recently published, Major Corbet makes a plea for research into the best strains and varieties of edible trees and shrubs and a vast replanting campaign. He suggests that many fodder trees could be included in windbreaks or shelter belts as a standby in drought years, and urges experimental work to determine the best methods of making top-feed available without destroying the trees.

Reckless cutting in drought years, overstocking and bushfires have already destroyed many thousands of these valuable trees.

With official assistance from various forestry and agricultural departments, Major Corbet has compiled a list of 44 species of native and introduced fodder trees which may be worthy of attention.

His 20-page pamphlet "Fodder Trees" is available from Perth booksellers, price 5s., post free.

CALTROP

[*Tribulus terrestris* L.]

Caltrop is native to the warmer regions of the Old World, but has spread to most countries where suitable climatic conditions favour its growth. It has a wide distribution in Western Australia where its spiny fruits cause injury to the feet of stock. It has toxic properties, but no cases of caltrop poisoning have been recorded in this State

WEEDS of Western Australia

By **G.R.W. MEADLY** M. Sc.
Officer in Charge, Weeds and Seeds Branch

CALTROP

(Tribulus terrestris L.).

SPIKED metal balls, known as "caltrops" were often used in medieval warfare, when areas of ground in front of defended positions were sown with these spikes to hamper the operations of enemy cavalry by crippling the horses. Although the fruits of Tribulus terrestris are not quite as severe in their effects, they do resemble the old implements of warfare and have taken their name.

Caltrop is native to the warmer regions of the old world, including tropical Australia, but has proved so adaptable to varying conditions of soil and climate that it has become a weed in practically every warm temperature country in the world. It occurs in every State of the Commonwealth and has a wide range in Western Australia, having been recorded from such places as Geraldton, Mullewa, Southern Cross, Merredin, Mukinbudin, Bruce Rock, Northam and the metropolitan area.

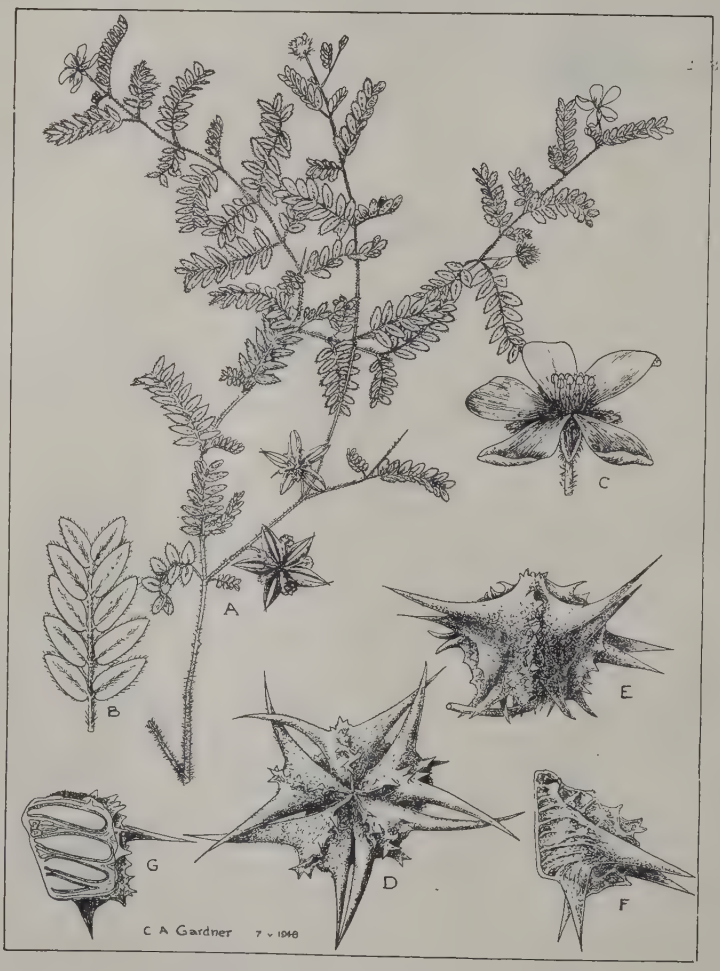
The manner in which this weed was introduced to the southern half of the State is not known with certainty but it could have originated from the north or alternatively have been imported in a variety of ways from other States or countries. The southerly movement of stock has probably been responsible for at least some of the occurrences. Caltrop produces a seed, or more correctly a fruit, which bears several spines and is somewhat similar in appearance to a doublegee. As in the case of that weed also, the fruits are spread by animals and the spines serve to attach them to the rubber tyres of vehicles, including aeroplanes. The name "puncture vine" applied to this plant in the United States is self explanatory.

DESCRIPTION

As indicated by the species name "terrestris," Caltrop is a prostrate plant with spreading stems which may extend for a distance of several feet from the more or less woody tap-root. The stems, especially the younger parts, are usually covered with silky hairs. The leaves are borne in pairs on opposite sides of the stem and are comprised of several pairs of leaflets having the upper surface darker green in colour. Single flowers on short stalks arise from the base of the smaller leaves. They are pale yellow in colour and scarcely exceed one half inch in diameter. When the flower fades a woody burr of five segments is soon formed. The burrs are about one quarter inch long and one half inch broad and when ripe, readily separate into the five segments. Each of these is wedge-shaped and bears two stout spines near the apex with two smaller ones towards the base but directed almost at right angles to the other pair. Each segment contains two to five seeds.

SIGNIFICANCE

Caltrop has undesirable features in several directions. The burrs are capable of causing mechanical injury to stock, es-



CALTROP *(Tribulus terrestris L.)*.

A—Habit; B—Leaf; C—Flower; D—Upper surface of burr; E—Lateral view of burr; F—Separate carpel (lateral view) G—The same in longitudinal section showing seeds.

Fremantle, R. D. Royce, Incon. origin.

Drawing by the Government Botanist, Mr. C. A. Gardner.

pecially horses. The spines penetrate the frog of the hoof and cause painful suppurating sores. Burrs ingested along with other herbage have caused mechanical injury to the lining and walls of the stomach and intestines.

The plant also possesses certain toxic properties, although no cases of poisoning have been recorded so far in Western Australia. South African investigations have proved that, when eaten, it causes a condition known as Dikoor or Geeldikkop, the typical symptoms being photosenitization of the ears, lips and skin surrounding the eyes followed by swelling of the head. Similar symptoms were reported from two areas in Queensland during 1936 when heavy losses of sheep were associated with grazing on pastures in which caltrop was plentiful. Weaners appeared to be more severely affected but sheep of all ages were included.

Trouble has also been experienced in New South Wales and observations in that State indicated that losses are most likely to occur when green, succulent or rapidly-growing plants are grazed during hot days. The absence of losses in this State is probably due to the fact that, although Caltrop has been recorded from widely separated localities, in no place does it comprise a major proportion of extensive grazing areas.

Caltrop has been declared a primary noxious weed for the State.

CONTROL

Prevention is always the most economical method and care should be taken to avoid the introduction of seeds, especially with stock, chaff, machinery and rubber tyres—agencies that are also responsible for the spread of doublegees.

As with all annuals, prevention from seeding is the first line of attack. The plants are typically of summer duration. They grow rapidly and form seed in a very short period.

When isolated plants appear they should be hoed and destroyed by burning and a careful watch maintained for further germination. If mature burrs are present care should be taken to avoid scattering them while pulling or hoeing. In such cases, if only small patches are involved it is often more satisfactory to build a fire on the plants or use a weed burner.

American evidence has show that Caltrop seedlings will continue to appear for at least eight years after all seeding has been prevented. In carrying out cultural operations to cope with more extensive areas these again should be undertaken before any seeding has taken place. Deep ploughing is inadvisable as the longevity of the seeds allows further germination when subsequent workings again bring them to the surface. Cultivation should be designed to destroy the plants and also to induce germination in order to exhaust the seed supply present in the soil.

Chemicals have been found very useful for caltrop control. The plants are killed by the application of oil sprays which can also affect the germination of seeds contained in dry burrs. On the farm, use can be made of old sump oil or a mixture of sump oil and diesolene or power kerosene.

The 2, 4-D or hormone-like preparations have also proved effective in comparatively weak solutions but, along with sodium chlorate and the arsenicals, have little effect on the germinating capacity of the seeds and therefore should be applied before flowering has commenced. Early spraying is also recommended when oils are used, for seeds in all burrs, especially those that are green, are unlikely to be killed by the treatment.

When the plants are small a solution containing one pound acid equivalent of 2, 4-D ester in 100 gallons of water is effective but with large plants the concentration should be doubled. Seedlings appear following late spring and summer rains and several treatments may be necessary in one season to cope with successive germinations.

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MOBILCO

A HANDY DRUM-TIPPING CRADLE

By W. M. O'DONNELL, Laboratory Assistant, Entomological Branch

THE tipping cradle described in this article provides a useful method of handling and emptying 44-gallon drums used as containers for petrol, oil, kerosene, water or other liquids. It was designed during the 1953-54 Argentine ant campaign when large numbers of drums were used to supply water to the spraying teams and it was necessary to evolve a method of filling the spraying outfits from the drums without loss of time and without waste of labour and materials.

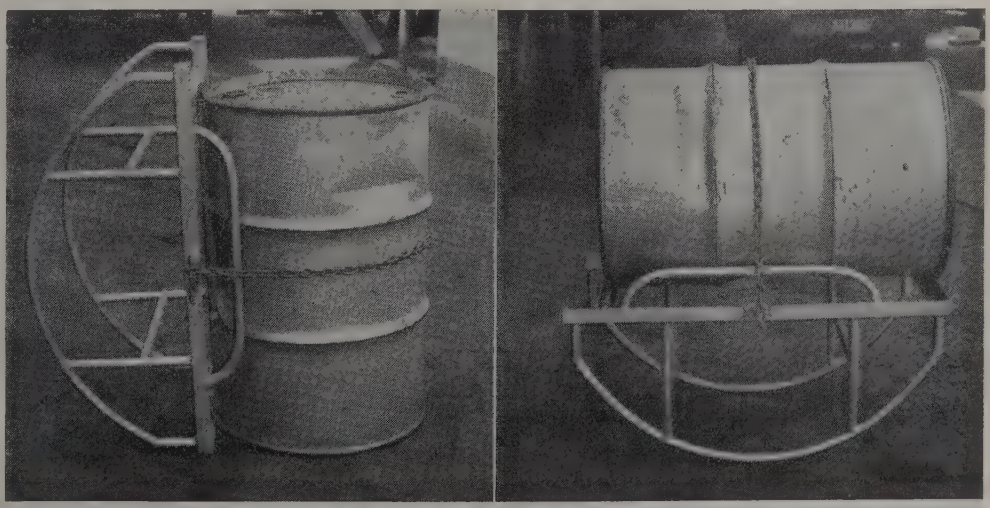
The semi-rotary and other types of pumps commonly used for drawing off small quantities of liquid from the drums were too slow in operation but the cradle, when used in conjunction with large-sized taps screwed into the bungholes of the drums, proved most effective. It enabled filled drums to be handled easily by one man.

The cradle illustrated here weighs 45 lb. and is constructed from ¼in. x 1½in. angle-iron and ¾in. pipe or steel tubing. It could be constructed easily by any farmer who can operate a welding plant.

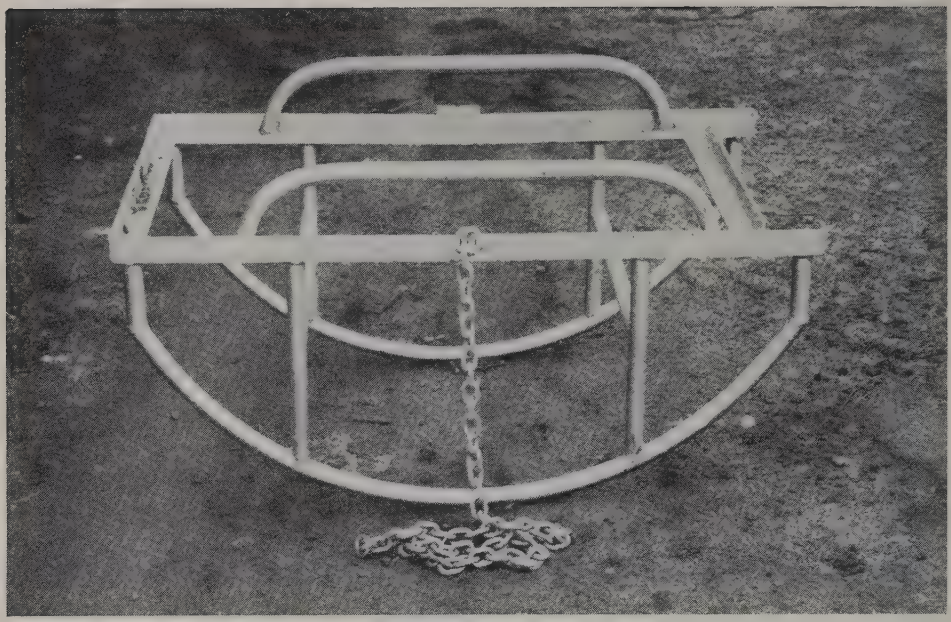
CONSTRUCTION

The two angle-iron side-members are 3ft. 6in. in length and the two angle-iron cross-members which complete the top frame are 1ft. 9in. long. The first cross-member is welded into position across the ends of the side-members. The other is placed in position the length of the drum (about 2ft. 11in.) from it.

Four 4in. lengths of piping are welded to the ends of the side-members and curved lengths of piping to serve as rockers are welded to these short uprights.



Left.—Placing the drum on the cradle. The flange of the angle-iron cross-member is slipped under the rim of the drum and the holding-chain is looped round the centre. Right.—Cradle and drum are pulled forward and balance on the rockers for easy emptying



Cradle, showing details of construction

Six lengths of piping are then welded to form two H-shaped stays which are welded into position between the rockers to ensure rigidity. The vertical distance from the centre of the rockers to the side-members should be 16in.

Two more lengths of piping are bent at the ends to form side-rails about 2ft. in length and these are welded in position on the side-members so that when the drum is on the cradle it rests on the side-rails and on the inner flanges of the angle-iron cross-members.

The drum is held in position by a length of trace-chain which has its end link welded to one of the side-members. The other end of the chain is secured by slipping one of the links through a slot cut in a short piece of angle-iron welded to the side-member.

CONTAGIOUS OPHTHALMIA (PINKEYE) OF SHEEP

By C. R. TOOP, Assistant Chief Veterinary Surgeon

CONTAGIOUS ophthalmia, better known to the sheep owner as "pinkeye," is a common disease of sheep particularly during the summer months. It is known to occur in the majority of countries where sheep are kept and, in Australia, is prevalent throughout the sheep raising areas. The disease is highly contagious and may spread rapidly through the flock. It is caused by a microbe known as Rickettsia conjunctivae which is always present in the discharge from the eyes of affected animals.

CAUSE

The disease is caused by a microbe known as *Rickettsia conjunctivae*. These organisms are always present in the eye discharges of affected sheep and the disease may readily be transmitted from animal to animal when discharge taken from the eye of an affected sheep is placed in the eye of a healthy sheep.

Under field conditions the infection is believed to be spread by flies and the fact that the disease rarely occurs during the winter months and that outbreaks are frequent during summer and autumn when flies are prevalent supports this view. Moreover, when diseased and healthy sheep are held in adjacent pens in which direct contact cannot occur it has been observed that the disease has spread to the healthy animals, providing further evidence of the part played by flies in the transmission of infection. In the same manner infection may spread through fences from one property to another.

The infective agent does not survive very long apart from the sheep, particularly upon drying of the eye discharge and it is, therefore, unlikely that sheep would become infected from trucks or yards previously occupied by diseased animals.

The view held by some sheep-owners that the disease is caused by dust or foreign bodies such as grass seeds is without foundation. It may also be mentioned that contagious ophthalmia of sheep is a highly specific disease which cannot be transmitted to other animals. The disease of cattle in which the symptoms are similar is caused by an entirely different type of organism.

SYMPTOMS

Sheep of all ages and breeds are susceptible to the disease. Both eyes invariably become affected but in some cases one eye may show evidence of infection a few days earlier than the other.

In the early stages of the disease there is inflammation and reddening of the conjunctivae (the membranes which line the eyelids and cover the front portion of the eyeball) with congestion of the blood vessels and swelling of the eyelids. This is accompanied by a profuse watery discharge from the eyes and discomfort upon exposure to bright light.

After a day or two the cornea (clear front portion of eye) commences to show evidence of opacity which first appears at the margin and may later extend towards the centre. The watery exudate is now replaced by a discharge of pus which issues from the corner of the eye and gums the eyelashes together. The opacity of the cornea is usually only partial and though the sight may be impaired it is not seriously affected. In a smaller proportion of cases, however, the whole of the cornea becomes involved by opacity presenting a white milky appearance. The sheep in consequence becomes completely blind and unless given special attention may die through lack of feed and water. Ulceration of the cornea occurs in some of the more severe cases.

Fig. 1.—The eye of a sheep affected by pinkeye. The eyelashes are gummed together with discharge and the cornea is becoming opaque
—(After Edgar)

In the majority of sheep which become affected the disease occurs in a mild form, the opacity does not extend far beyond the margins of the cornea and complete recovery occurs within 10-14 days from the onset of the symptoms. In severe cases, however, the disease may persist for as long as six weeks and the animal may remain blind for a month during this period. It has been observed that the eye of the sheep has remarkable powers of recovery and that even when the cornea has become opaque and deeply ulcerated healing will occur leaving little or no blemish.

CARRIERS

After the symptoms have subsided and recovery has occured the causative organisms may persist in the eyes for several months. Investigations have shown that in about half of the sheep which has suffered from an attack of the disease the organisms are still present in the eyes 100 days after contracting the infection. One case in which a sheep remained infective for 250 days has been recorded.

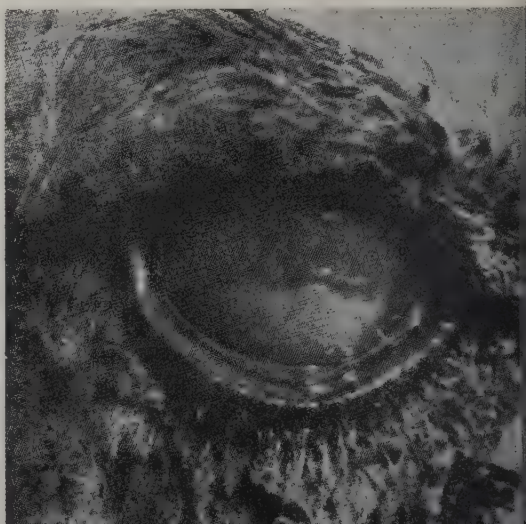
Such sheep remain carriers of the disease and while showing no symptoms themselves they are able to transmit infection to other sheep with which they are in contact. The presence of these carriers will explain why recurrent outbreaks of the disease may take place in a closed or self-contained flock without the introduction of infected sheep from an outside source. Under such circumstances isolated cases may continue to occur in the flock passing unnoticed until conditions favouring the spread of infection such as droving or yarding for shearing or crutching during a period when flies are prevalent precipitate a severe outbreak. It also explains why sheep which are apparently healthy at the time of purchase may subsequently develop the disease.

IMMUNITY

Recovery from the disease does not result in the development of a lasting immunity. Investigations have shown that recovered animals are resistant to re-infection for a period of about three months following upon which the immunity gradually wanes. More than 50 per cent. of recovered sheep, however, remain resistant for a year. When this resistance is lost the sheep again become susceptible and may suffer a further attack of the disease if exposed to infection.

When the relatively short duration of the immunity is considered together with the presence of carriers in the flock the periodical occurrence of fresh outbreaks of the disease will readily be understood. Moreover each fresh drop of lambs will result in the addition of a large number of highly susceptible animals to the flock thus increasing the chance of further outbreaks occurring.

Fig. 2.—A more advanced case. The cornea is opaque and ulcerated and there is an accumulation of dried discharge below the eye
—(After Edgar)



TREATMENT

Mild cases of the disease recover spontaneously and do not require treatment. This type of case predominates in the majority of outbreaks of contagious ophthalmia and observations have shown that recovery commences on the third or fourth day and is complete about seven days thereafter. It has been shown that the treatment of mild cases does not increase the rapidity of recovery. In experiments in which one eye was treated with 10 per cent. zinc sulphate solution and the other left untreated as a control it was found that the untreated eye recovered just as rapidly as the treated one.

Severe cases showing opacity of the cornea, ulceration and blindness, however, require special attention, otherwise they may suffer serious loss of condition or death may result from starvation or thirst. Such sheep should be removed from the flock and transferred to a small hospital paddock where there is good shade and easy access to feed and water or, better still, they may be placed in the shearing shed where there is complete shade and hand-feeding may be practised.

For the treatment of these cases a 10 per cent. solution of zinc sulphate is recommended, a few drops of which should be placed in the affected eyes daily until recovery has occurred. This lotion may be prepared by dissolving two ounces of zinc sulphate crystals in a pint of water and may be applied with some convenient type of eye-dropper after separating the lids with the thumb and forefinger. A small oil-can will be found very useful for this purpose.

Better results may be obtained from the application of 1 per cent. chloromycetin eye ointment but its use is limited by its high cost. It may, however, be recommended for the treatment of stud animals or for small groups of flock sheep. This preparation is supplied in $\frac{1}{8}$ ounce tubes. A small amount should be squeezed out onto the tip of the finger and smeared beneath the lower lid. Two applications are recommended daily for severe cases but in the molder ones one treatment daily will suffice. An improvement should be noticed in 2-3 days and recovery may be expected after a week.

Wool should be clipped from around the eyes before treatment is commenced and any foreign bodies such as grass which may be present removed with blunt forceps.

PREVENTION

There is no effective method of prevention and since the eye lotions in common use cannot be relied upon to destroy the organisms present in the eyes, the practice sometimes adopted by sheepmen of treating all members of the flock in an endeavour to check the spread of infection cannot be recommended.

Indeed since this procedure by bringing the sheep into closer contact with one another favours the spread of infection it is likely to cause more harm than good.

It is far better to allow the flock to remain undisturbed making a daily inspection for the detection of badly affected or blind animals which should be transferred to a hospital paddock or the shearing shed for treatment.

Precautions should, however, be taken to prevent the introduction of the disease into a clean flock and a careful examination for the detection of ophthalmia should always be made whenever the purchase of additional sheep becomes necessary.

While the absence of symptoms does not necessarily denote freedom from infection, since carriers may be present, a careful inspection prior to purchase may succeed in preventing the introduction of the disease into the flock and it is a precaution which should never be neglected.

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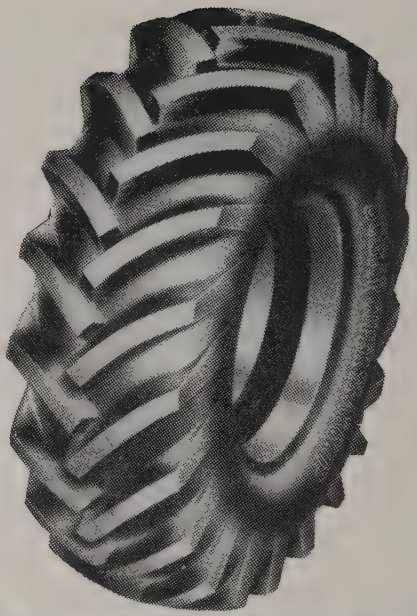

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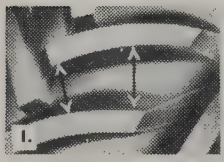

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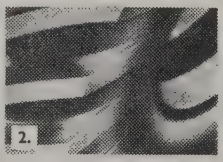

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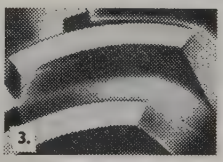

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THE BEHAVIOUR OF TOBACCO VARIETIES IN WESTERN AUSTRALIA

By T. G. HANEY, B.Sc. (Agric.), Officer in Charge, Tobacco Branch, and
A. J. E. LYNEHAM, B.Sc. (Agric.)

WITH the advent of a number of new varieties into the district, several problems have arisen, and this article is being written in an endeavour to set down just what is known of the varieties being tested. In order to make definite recommendations regarding a certain variety of tobacco, it requires to be tested under a wide range of soil and climatic conditions. To cover as wide a range of weather conditions as possible, the variety needs to be grown for three years before any real recommendation is warranted. To cover a wide range of soil types, trials have been conducted in several areas over the past two years and results are being accumulated.

The need for high-yielding varieties of tobacco of good quality is evident. At the present time and in certain cases, it may be necessary to sacrifice a certain amount of weight per acre in order to gain quality. When a new variety is grown, not only the grower becomes involved, but also the manufacturer and consumer.

The main reason in this district for the introduction of new varieties is that in recent years, the consumer preference has been for cigarette tobaccos which require bright-coloured, thin-textured leaf. The older varieties were adapted to pipe and plug tobaccos which were rather drooping in habit, whereas an erect habit of growth is a feature of the majority of new varieties.

Although it is recognised that there is a definite need for blue mould resistant varieties, no quick results can be expected, but work is progressing along these lines overseas.

To obtain the maximum return from any new variety, growing practices may have to be altered. Such factors as time of planting, fertilising, spacing, topping, and methods of harvesting and curing may need readjusting. For these reasons it can be seen that once a new variety shows some promise, several further seasons of testing may be required before the best methods of handling of the variety are discovered. It has been found in Canada, for instance, that the new varieties require higher rates of phosphate and potash to produce maximum yields of good quality tobacco.

It has been found that several of the new varieties mature several weeks earlier than the older ones, and in this district, this is a definite advantage owing to the short growing period in some seasons.

Tabulated below is a list of varieties at present under test, with relative remarks as to colour, size of plant and leaves, thickness, texture, curing ability and suckering characteristics.

Cross Hickory.

A selection from Hickory Prior. Popular in the State for a number of years. Although bottom leaves are of good width, leaf from half way up the plants is long and narrow. Texture of leaf is good, but colour is a little dark. Suckers freely and is difficult to cure.

Virginia Gold.

Selection from a cross between Yellow Special and Cash. Imported from Canada into Victoria approximately five years ago. A wide leaf to the top of the plant, and grows with a yellowish cast throughout the season. This variety must be allowed to ripen well before harvest. Leaves towards the top of the plant tend to be harsh, and should be grown on good, moist soil. It is not recommended for growing on new land. The onset of cooler nights may be the cause of the leaf being harsh textured. In some areas, it is giving a high proportion of red coloured leaf, although colour generally is very bright. It is difficult to cure with other varieties and sponges readily when colouring pro-

cess is prolonged. Matures a week to ten days before cross hickory. Very few suckers.

401.

Selection of 400 x Cash. The variety has been grown in Australia for a number of years. It is said to be best suited for the heavier types of soil, but is very prone to wind damage. Bottom leaves are broad and long and top leaves have good width and texture. Leaf must be harvested ripe. Suckers fairly heavily. Apparently suitable on soils on which Virginia Gold goes hard, and on newly cleared country.

402.

A selection of a cross of 400 x Jamaica. Somewhat similar in type to 401 and gives similar quality leaf. Not so susceptible to wind damage as 401. Fairly low sucker count.

Hicks.

A farmer's selection. The variety has been grown in the area previously, but was not carried on. Has given good results in other parts of Australia under irrigation. Leaf is rather narrow in relation to other varieties except cross Hickory, but is of fine texture. Should be suitable on new land with good moisture where wind is prevalent. Easy to cure. At its best in a wet season or under irrigation.

Delcrest.

This variety was first released in Canada in 1948, and at present constitutes the majority of crop grown in the Ontario area in Canada. Good results have been also obtained in Southern Rhodesia. It is resistant to black root rot.

Delcrest was first tested in this district during the 1953-1954 season, and on appearance, it is very poor, having rather long narrow leaves. However, cured leaf was exceptionally bright, and the texture was good. Yields have been high. It appears that further detailed trials are required on this variety on varying soil types, since on relatively new land, some harsh quality leaf was produced. A medium amount of suckers produced.

Yellow Special.

This variety has been tested for several years, but no outstanding results have been achieved. Leaves are of medium width, and it suckers fairly profusely.

Silver Dollar.

Somewhat similar to Gold Dollar in growth characteristics. Has been tried for only one year, and results as yet are inconclusive. Curing is not so easy as other newer varieties.

Bottom Special.

The leaves are rather closely spaced, of medium width and fairly long. Top leaves are narrow and below average. Bottom leaves give a fair quality leaf.

Broadleaf.

An importation from New Zealand, and has had average success in trials over several years. Appears to require a better class soil with good moisture content.

Although full details of the variety plots are not yet available, the following tables are set out in order to give growers some indication of the behaviour of varieties before planting. In computing average prices and values per acre, prices received for similar leaf last year have been used. These values should be used on a relative basis only, and plots in various districts should not be compared. In considering the quality of leaf produced, it is pointed out that all these varieties were cured together in the same kiln, and in some instances, e.g., 401 and Silver Dollar, leaf was downgraded because of excessive sponging. If cured by themselves, it is possible that some leaf would be of higher quality.

Figures which go to make up percentage of green leaf includes weights of both green cast and immature leaf. The higher grades of green cast leaf [illegible] values which were only a little below those of the ripe grades. This figure is given to indicate at what stage of ripeness leaf of each variety should be harvested. The figure for percentage of leaf discarded was derived by subtracting the amount of saleable leaf from the total quantity harvested, and reflects the amount of trashy, dark, hard and immature green leaf obtained.

The following are the numbers indicating the locations and treatment of the plots.

(1A)—South Manjimup: Not topped.
(1B)—South Manjimup: Topped.
(Property—A. Maras.)
(11A)—Northcliffe: Not topped.
(11B)—Northcliffe: Topped.
(Property—R. Bell.)

Table 1.

(1A).—SOUTH MANJIMUP—NOT TOPPED.

Variety.	Total Yield.	Yield of Saleable Leaf.	Discarded Leaf.	Green Leaf.	Boardy Leaf.	Average Price.	Value per Acre.
	lb./acre.	lb./acre.	%	%	%	pence/lb.	£
Bottom Special	1,079	833	22	7	....	88	305
Hicks	1,348	1,156	14	8	2	87	418
Yellow Special	892	819	9	7	....	80	273
Broadleaf	1,389	1,110	19	7	....	85	393
401	1,037	913	12	4	....	85	323
402	856	814	5	11	....	78	265
Delcrest	1,379	1,260	9	1	....	107	562
Virginia Gold	1,462	1,115	24	7	9	68	316
Cross Hickory	1,400	1,146	18	2	....	87	407
Silver Dollar	1,026	881	13	2	....	85	312
Average	1,187	1,005	....	....	....	....	357

(1B).—SOUTH MANJIMUP—TOPPED.

Bottom Special	1,032	975	5	13	4	91	370
Hicks	1,047	1,022	2	10	....	116	494
Yellow Special	1,289	1,058	14	15	....	107	472
Broadleaf	1,405	1,328	6	1	10	101	559
401	1,312	1,053	20	13	....	87	382
402	1,198	1,162	3	4	....	123	596
Delcrest	1,671	1,602	5	3	4	114	760
Virginia Gold	1,592	1,385	13	28	25	102	588
Cross Hickory	1,291	1,027	20	16	....	115	492
Silver Dollar	1,068	965	9	1	....	96	386
Average	1,290	1,158	....	....	....	....	510

Bottom Special.

Low value per acre in both plots—small percentage of harsh textured leaf in the topped plants.

Hicks.

Value increased only slightly by topping—yield decreased in the topped plot, but growth in the area was reduced owing to an excess of moisture. Average price of leaf increased considerably by topping.

Yellow Special.

Value nearly doubled by topping—no boardy leaf evident.

Broadleaf.

A large percentage of bottom leaf was discarded in the untopped plot, and no harsh leaf was produced. In the topped section, however, the percentage of leaf discarded was reduced, but 10% of boardy leaf resulted. The value of the leaf in both cases was relatively good.

401.

This variety was low in values in both cases. Topping of the plants increased the total value, but decreased it relative to other varieties. As mentioned previously, this variety does better on the heavier soil types. Leaf from the topped plot was very sponged, indicating that it was picked too ripe for curing with other varieties.

402.

When topped, the value of leaf harvested was more than doubled, and both yield and value were significantly increased. Leaf harvested from an untopped crop needs to be very ripe. The amount of cutters and high grade leaf increased significantly in the topped plot.

Delcrest.

The value of leaf harvested from both plots is outstanding being well above other varieties. Topping the plants gave a de-

cided increase in yield and did not lower the quality of the leaf, except for the production of 3% of boardy leaf.

Virginia Gold.

When plants were topped the value of the leaf increased considerably, even though high percentages of leaf were either green or boardy. There was a certain amount of boardy leaf even in the untopped plot. A higher proportion of leaf harvested in the topped plot went into the lug and higher leaf grades.

Cross Hickory.

The fact that tip leaf from Cross Hickory is hard to cure, especially with other varieties, is borne out in this trial. The majority of the leaf in both plots discarded consisted of green tips and top leaf. The variety responded to topping, but to a lesser degree than other varieties.

Silver Dollar.

Whilst there was a certain amount of poor sponged leaf in the untopped plot, the leaf discarded from the topped portion was green. The variety has no outstanding characteristics.

Discussion

As stated previously, no attempt is being made at this stage to make a definite recommendation on a particular variety. From the figures it will be seen that the most outstanding fact is that topping was beneficial to all varieties, increasing the average value per acre by £150. Some varieties responded more to topping than others. Delcrest gave significantly better leaf in both cases, but since it has been grown for only one season, further detailed tests will be required. The value of Virginia Gold is that yield is high and even though top leaves tend to be of a boardy nature, cutters and lower leaves are in high proportion and of excellent quality.

Table 2.

(11A).—NORTHCLIFFE—NOT TOPPED.

Variety.	Total Yield.	Yield of Saleable Leaf.	Discarded Leaf.	Green Leaf.	Boardy Leaf.	Average Price.	Value per Acre.
	lb./acre.	lb./acre.	%	%	%	pence/lb.	£
Bottom Special	866	731	15	18	1	88	268
Hicks	897	793	12	36	....	98	324
Yellow Special	1,011	907	10	25	2	117	446
Broadleaf	1,265	1,120	11	2	....	128	598
401	1,157	985	15	23	10	108	443
402	1,177	804	32	11	9	94	315
Delcrest	1,296	1,011	22	20	17	107	452
Virginia Gold	1,068	980	8	30	....	102	417
Cross Hickory	1,483	1,212	18	21	....	99	501
Silver Dollar	1,405	1,125	20	20	2	85	399
Average	1,162	967	....	....	....	....	416

(11B).—NORTHCLIFFE—TOPPED.

Bottom Special	1,182	933	21	1	5	96	374
Hicks	1,670	1,483	11	20	....	92	566
Yellow Special	1,514	970	37	25	2	106	416
Broadleaf	1,400	1,239	11	15	1	112	580
401	1,426	1,042	25	18	8	98	435
402	1,240	1,011	18	51	....	66	278
Delcrest	1,286	1,115	13	24	5	101	467
Virginia Gold	933	539	42	22	31	88	298
Cross Hickory	570	467	19	8	9	107	208
Silver Dollar	1,001	866	13	18	....	98	354
Average	1,222	966	....	....	....	....	398

Bottom Special.

Yield was low in the untopped portion due to an excess of moisture. Boardy tips were harvested from the topped plot.

Hicks.

Untopped plot in a wet patch and consequent low yield. There was a high proportion of cutters and high grade leaf in the topped area, and no coarse leaf in either plot. Requires to be harvested ripe.

Yellow Special.

Must be harvested very ripe, profuse suckers on this variety and not recommended for topping.

Broadleaf.

Good value per acre in both plots, but a higher value per pound in the untopped portion.

401.

Topping increased the yield but caused a decrease in the value.

402.

Top leaves of this variety require to be harvested very ripe, especially after topping. A proportion of red coloured leaf was produced.

Delcrest.

Top leaves need to be very ripe—a high percentage of coarse leaf in the untopped plot.

Virginia Gold.

Yield reduced in topped portion because of excess moisture. A high percentage of green and boardy leaf was produced in this plot. In the untopped portion, no boardy leaf was produced and a higher proportion of leaf was graded into the higher leaf grades.

Cross Hickory.

Yield low in topped area due to excessive moisture and top leaf was not harvested.

Silver Dollar.

Nothing outstanding in this variety.

Discussion

Generally, the figures have shown that topping has not had any beneficial effect except in the case of Hicks. During the past few years, a high proportion of boardy leaf has been produced in the Northcliffe district, and it appears that any variety which tends to produce this type of leaf should not be grown, except on specially selected pieces of land.

GENERAL SUMMARY

Varieties grown at Northcliffe behaved entirely differently from those grown at Manjimup. For this reason, growers should not be guided primarily by results which have been achieved elsewhere with different varieties, but should go on experience in their own district, or even their own farm. With the variability of soils and moisture contents of soils in the lower south-west, it is advisable for a grower to test any new variety on his own farm, by growing several rows in various sections of the paddock, on moist and drier ground. In this way, it can be determined which variety is most suitable under his own particular soil conditions after a general recommendation has been made.

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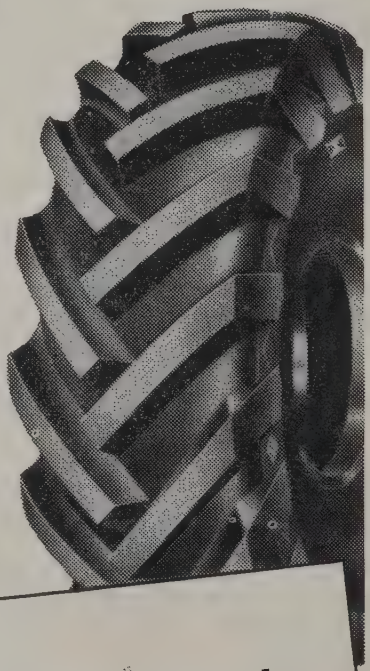

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A CRUSH FOR THE TUBERCULIN TESTING OF CATTLE

By A. RIPPER

ALWAYS a useful asset on any farm where livestock are kept, a strongly-constructed crush is essential where tuberculin testing makes it necessary to deal with dry stock, bulls and young animals that have not been previously handled. The crush described in this article was specially designed for tuberculin testing, but will serve equally well for vaccinating, branding, de-horning—in fact for any operation where restraint is necessary.

The main features of this crush are:—

(1) An end bail (E) in which the head of the beast is held firmly while the test is being applied.

(2) An exit gate (D) through which the animal passes out of the crush after release from the bail.

(3) A block-gate (B) which swings inwards, completely blocking the race against the oncoming cattle to allow sufficient space for the operator to enter the crush at the rear of the beast held in the bail, in order to make an injection of tuberculin into one of the skin folds at the base of the tail.

When the block gate is swung across the race, there should be a distance of not less than 8ft. between it and the bail. This will provide sufficient length to accommodate the largest beast, and at the same time leave adequate space behind the animal to enable the operator to carry out the test.

The structure need not be elaborate, but must be strongly constructed. Uprights should be of heavy timber sunk deeply into the ground and the rails should be strong enough to hold even a struggling animal safely. No details of timber sizes, hinges, catches or bail design have been included since it is expected that the majority of farmers will have their own ideas and preferences and will make use of material already available on the property. Where sawn timber is not available, bush timber may be used successfully.

The width of the crush and race is important and they should not be wider than 2ft. 3in. This measurement is sufficient to allow large dairy cows to pass through, but will prevent small stock from turning in the race when they are not tightly crushed. The 2ft. 3in. is the inside measurement, all rails being recessed into the inner portions of the uprights so that there are no projecting corners or protruding bolts which could injure the cattle.

The exit gate (D) can be from three to five feet wide according to preference and according to the material on hand. Its width will influence the width of the panel (C) which is designed to give the added length between the bail (E) and the block gate (B)—together they should give about 8ft. of standing room for the beast in the bail.

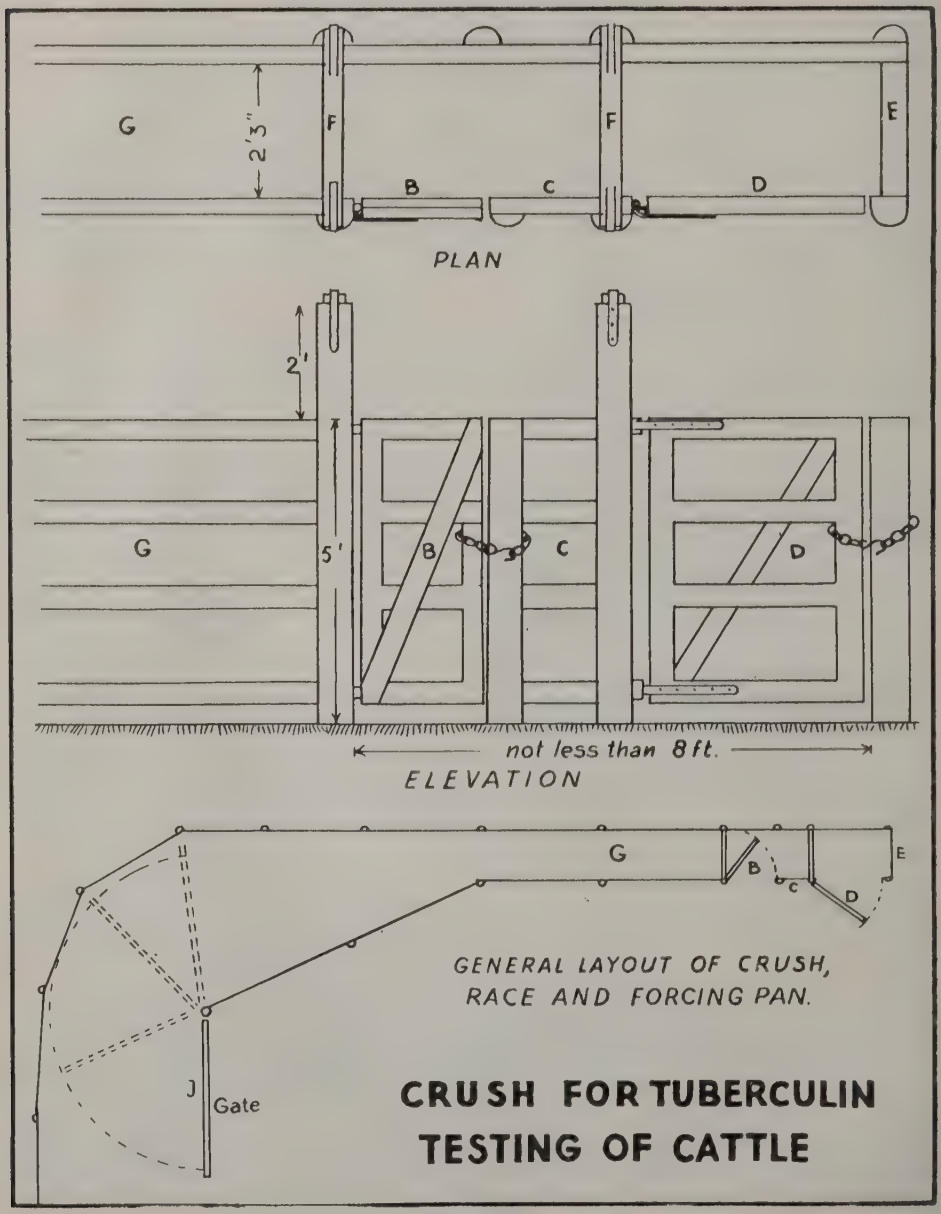
The end bail which actually holds the animal may be constructed to the owner's own design, but should preferably be a self-locking bail that is readily adjustable to animals of different sizes.

The gate-posts should be reinforced by tie-beams across the top (F) in order to prevent the gate from sagging and to guard against the race spreading under pressure from the stock.

The race (G) should be 5ft. in height with 9in. between the rails. The length of the race will vary with individual requirements but a length of about 20ft. will be found

suitable for the average dairy herd. Do not make the inside width greater than 2ft. 3in., and make certain that there are no projecting bolts or rail corners.

The diagram of the general layout suggested shows a forcing-pen for filling the race. This is closed by a large gate (J) from the holding yard (K).



ANTIBIOTICS IN POULTRY NUTRITION

A Review of Recent Research Work

By I. C. MILLER, B.Sc. (Agric.)

OVER the past few years considerable publicity has been given to the use of "growth-promoting" substances in the rations of livestock. As yet, comparatively little is known concerning the manner in which these substances benefit the birds or animals, but in this article I have endeavoured to indicate the results of research work which had been carried out and the lines on which current research is now operating.

Most farmers are already aware that proteins play a very important part in livestock rations. These proteins are not all constructed on the same pattern but are built up from several substances known as amino acids. Just as the pattern and nature of say a brick wall can be varied by using different types of bricks in its construction, so can the protein be varied according to the number and types of the amino acid "bricks" from which it is composed.

It has been recognised for a long time that proteins of animal origin such as those found in milk or meat are better for promoting growth than the vegetable proteins such as those found in fodder plants. It was thought that this was due to the fact that animal proteins possibly contained more and possibly better-balanced selections of the amino acids required for animal growth than did the vegetable proteins. As a result of the number of investigations which were carried out by research workers it soon became evident however that some other factor present in the animal protein played an important part in the growth stimulation of pigs and poultry. For want of a better name this was called the Animal Protein Factor or A.P.F.

A NEW VITAMIN

In 1948, a new vitamin isolated from liver extract was found to possess growth-promoting properties when added to vegetable diets. This vitamin, known as the anti-pernicious-anaemia, or B12, vitamin was established as the important part of the Animal Protein Factor.

It then became necessary to discover other sources from which this vitamin could be obtained and it was found to exist in the crude residues from the industrial preparation of "antibiotics"—especially aureomycin and streptomycin.

It is well known that some moulds secrete substances which have the ability to suppress the growth of certain types of bacteria and these substances are known as "antibiotics". Penicillin was the first of these substances to capture the popular imagination and its discovery was followed by many others, the range of which is still being extended. When these industrial residues were used as growth-promoting agents in poultry rations, a somewhat surprising result was obtained. It was found that these crude residues gave a greater growth-promoting effect than equivalent quantities of pure vitamin B12 and it was shown in 1950 that this greater response was due to the traces of aureomycin remaining in the residues.

VARIED RESULTS

Since then a considerable amount of work has been carried out on the use of antibiotics in rations containing varying proportions of vegetable and animal proteins. The most noticeable fact arising from all this work is the very great degree of variability in the results obtained.

It is obvious from the experiments carried out in many countries that the use of antibiotics will not reduce increases in the growth rates in poultry in every case. Various theories have been put forward to explain this and it may be of interest to examine some of them.

Firstly it was believed that the antibiotics stimulated growth by changing the bacteria in the chicks' intestines from "undesirable" to "desirable" types. These desirable types produced unknown factors which are responsible for the growth effect. Howevere, results from studies to determine changes in the bacterial population of the gut are very varied—some record considerable changes; others none at all.

THE INFECTION THEORY

As you know, antibiotics are used primarily to combat diseases and the obvious suggestion has been made that the growth promoting properties may be due to the suppression of harmful bacteria, especially if housing and sanitation are poor. This then gave rise to the "Infection" theory which assumed that the antibiotic in feeding stuffs controlled a disease which, though not present in a form severe enough to produce any well-marked symptoms would nevertheless depress the growth rate. Many workers have found that birds kept in new premises do not respond to antibiotics but similar birds housed in old "germ-laden" sheds do respond quite markedly.

"Beginners' Luck" is a common saying in the poultry industry and this could result from the cleanliness to be expected in new yards and pens. The infection theory is supported by some very interesting work carried out using "germ-free" chicks. It was found that the growth of ordinary chicks was raised from 4-10 per cent. by antibiotics but the "germ-free" birds on a similar diet did not respond to the antibiotic. However they did grow as well as the treated ordinary birds and this fact indicated that the function of the antibiotic was to destroy the bacteria which depressed the growth rate, rather than to supply additional nutrients. This theory seems quite a logical one but it is by no means universally accepted.

An interesting difference was noted between the "germ-free" and ordinary chicks and that was a difference in the thickness of the lining of the gut. The "germ-free" chicks had a thinner lining which the workers theorised enabled more efficient utilisation of the feed and therefore a faster growth rate.

Some workers obtained a growth response by injecting antibiotics instead of providing them in the feed. They concluded that the growth-stimulating activity of antibiotics could be due to a direct action within the chick rather than to an indirect action on the bacteria in the gut. It has since been shown, however, that antibiotics injected into the bloodstream can pass into the gut cavity and so affect the bacteria.

It has also been reported that the water consumption of treated animals is very much greater than that of the controls but there is no consistent evidence on this point. Certainly in the experiment conducted here there was no apparent differences between the groups.

Another unproven theory is that animals receiving antibiotics show an increased appetite, but this effect on the appetite could be secondary, that is, it could result from general well-being rather than be a primary cause.

LOCAL EXPERIMENTS

At the Animal Health and Nutrition Laboratories, two trials have been conducted to determine the possible effect of feeding a penicillin supplement in a practical ration.

In the first trial, 70 turkey poults of mixed sex were used and the antibiotic tablets (penicillin) were dissolved in the drinking water. No significant difference was obtained between the treated and untreated birds, although turkeys are reputed to be very responsive to antibiotics.

The second trial employed 8 groups, each of 15 cockerel chicks. Four groups received procaine penicillin in the feed and other four groups were used as controls.

At 16 weeks of age the penicillin groups were significantly heavier than the control groups, the difference being noticeable from the first week onwards. By the 22nd week, however, there was no difference at all. This follows the general pattern of several investigations—a marked response in the early stages but by the time maturity is reached there is little or no difference between the birds.

The pens used for this experiment, although cleaned with hot caustic solution prior to the beginning of the trial, had

been used to house poultry for some time previously. The fact that there was no difference in mortality in the groups, however, suggests that the results obtained were not due to suppression of any obvious disease.

It is always necessary when reporting or reading the results of any experiment to remember that those results were obtained under certain conditions of feeding and environment and that they will not necessarily be repeated in any other cases.

SUMMARY

From a consideration of all available experiments, however, we can summarise some facts which have been fairly consistently true.

1. Young growing birds show the greatest response to antibiotics and, therefore, the use of antibiotics in the rations of mature fowls is unwarranted. Obviously, in order to gain the greatest financial benefit it is necessary to market the birds before the effect of the supplement has been reduced, i.e., before approximately 19 weeks of age in the case of cockerels.

2. The use of antibiotics has no influence on the age at which pullets commence laying or on the subsequent egg production.

3. Antibiotics, even under conditions most favourable to their beneficial effect, cease to stimulate growth from approximately the 12th week and can therefore be withdrawn from the ration after this period.

4. There is no conclusive evidence to show that the feeding of antibiotics reduces the protein requirements of poultry.

5. No response has been obtained in the growth rate of ducks but positive results have sometimes been obtained with geese. Very little work on these species has been carried out so far.

It must be kept in mind that antibiotics in animal nutrition should not be considered as "wonder drugs". They will not replace good feeding and careful sanitation and also their effect is far from consistent.

Although under some conditions the use of antibiotics will have advantages, there could be a very real danger in their unrestricted use.

It is common knowledge that the continued use of antibiotics in the control of disease has led to the development of resistant strains of bacteria in the same way as insects have developed resistance to various insecticides. It is possible that the continuous feeding of antibiotics will result in a gradual lessening of the response due to resistant strains tending to become dominant. It therefore seems desirable to restrict the use of antibiotics to the control of bacterial disease by massive dosage rather than run the risk of developing resistant noxious strains by the consistent feeding of small amounts in an attempt to promote growth.

The evidence available indicates that good feeding and cleanliness, over a period, will provide results equally as good as those obtained by supplementing the ration with antibiotics.

Reference

Bravde, R.; Kan, S. K. and Porter, J. W. G., "Antibiotics in Nutrition."
Nutrition Abs. and Revs. 1953, 23 473-495.

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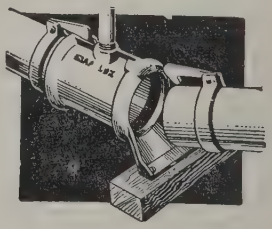

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ACETONAEMIA IN THE DAIRY COW

By C. R. TOOP, B.V.Sc., Chief Veterinary Surgeon

ACETONAEMIA—sometimes called ketosis or acidosis—occurs quite frequently in dairy herds, but is rarely recognised as such by dairy farmers. Many cases of the disease have been encountered in the field and many others have been reported in which the description furnished has left little doubt concerning the identity of the condition. The available information suggests that the incidence of the disease has increased during recent years. For the most part, acetonaemia occurs during the first six weeks of lactation and is characterised by loss of appetite, marked reduction of milk yield, rapid loss of condition, listlessness and constitpation, and at times by the presence of a peculiar sweetish odour which may be detected in the breath, milk and urine. In some cases there are nervous complications.

The mortality rate is low and recovery is the rule. Since the disease occurs during lactation when it greatly depresses the milk flow it may become a source of considerable loss. The majority of cases respond promptly to appropriate treatment.

CAUSE

The actual cause of the disease has not been determined but there is little doubt that it is a nutritional disorder. It is believed to be due to a derangement of metabolism in association with which the blood sugar falls below the normal level and abnormal amounts of toxic substances known as ketone bodies accumulate in the blood and tissue fluids. This may be due to a failure on the part of the animal to derive a sufficient amount of carbohydrate from its diet or to an inability to properly utilise the carbohydrate that is available. Carbohydrates are represented by such substances as starch, fibre and sugars and provide the principle source from which an animal derives its energy requirements. When the carbohydrate falls below the required level the animal is forced to draw upon its fat reserves. When fat is completely burned or oxidised in the body the end products are carbon dioxide and water which are excreted and cause no ill effects.

For the complete combustion of fat an adequate supply of carbohydrate is necessary. When the supply of carbohydrate is inadequate the oxidation of fat cannot proceed to completion but becomes arrested at an intermediate stage wherein the fat has become converted to substances known as ketone bodies which accumulate in the blood and are excreted in the breath, milk and urine to which they impart a characteristic odour. Ketone bodies are acid in reaction and possess toxic or poisonous properties. Acetone is one of these and it is from the presence of this substance in the blood that the name acetonaemia is derived.

The latest information available suggests that the actual cause of the upset in carbohydrate metabolism is due to a glandular deficiency. It is thought that there is a temporary failure of the adrenal gland (a small gland located near the kidneys) so that one of the hormones essential to carbohydrate metabolism is produced in insufficient amounts.

The functions of the adrenal glands are in turn controlled by the pituitary of "master gland" of the body. This gland located just below the brain secretes, amongst others, a hormone called the anterior pituitary corticotropic hormone, which is now commonly known as A.C.T.H. and which regulates the output of hormones from the cortex of the adrenal gland.

The production of A.C.T.H. is increased when the body is subjected to strain, cold, heat, exhaustion or high body temperatures caused by fever. The adrenal gland goes

to work to help the body meet the needs caused by such stress but continued heavy strain or stress however, causes certain changes in both the pituitary and adrenal glands as well as some of the organs of the body. The resultant upset in carbohydrate metabolism probably produces the symptoms of the disease.

SYMPTOMS

Although the disease may occur at any time during the lactation period, the majority of cases occur from about a week to six or eight weeks after calving. Cows of any age may be affected but the condition is most frequently observed in well-nourished high-producing animals. Two forms of the disease may be recognised—the digestive form and the nervous form. The former is most commonly encountered.

Digestive Form.

In this form of the disease there is a sudden or gradual loss of appetite and this is accompanied by a rapid loss in condition and a marked fall in the milk yield. The bowels are usually constipated, droppings being passed infrequently and in small amounts. Diarrhoea has been observed in some cases but this is unusual. The cow is dull and listless and a sweetish chloroform-like odour of acetone may in some cases be detected on the breath, milk and urine.

The detection of this characteristic odour may depend on the keenness or otherwise of the investigator's sense of smell. While it will be immediately noticed by some people on entering a shed occupied by an affected animal, others will fail to detect anything unusual.

Nervous Form.

In addition to the symptoms occurring in the digestive form of the disease, cows affected by acetonaemia may show a variety of nervous symptoms. In some cases there may be constant licking of the skin or licking or biting at the manger and other objects. There may be sucking of the tongue, slobbering from the mouth, grinding of the teeth, champing of the jaws and rolling of the eyes. The gait may be staggering and unsteady and the cow may have difficulty in remaining on her feet; she may fall and may remain down for some time before being able to regain her feet. Other symptoms which have been described include marked excitement with wild expression and staring eyes, violent movements, walking in circles, stringhalt and convulsions.

It should be recognised that the digestive form of the disease predominates and that only a small proportion of cases may become complicated by one or more of the nervous symptoms above described.

COURSE OF THE DISEASE

The majority of cases of acetonaemia terminate in recovery. With appropriate treatment recovery will usually occur within the space of a few days. Untreated cases or those which fail to respond to treatment, however, may persist for several weeks during which period the animal becomes emaciated and the already diminished milk flow may cease entirely. In prolonged cases the cow may be rendered worthless until the next lactation period. Severe emaciation and debility may result in the death of the animal. The mortality rate, however, is very low. Some animals are subject to recurrent attacks of the disease, an apparent recovery accompanied by a return of appetite and rumination being followed shortly afterwards by a relapse.

DIAGNOSIS

From a consideration of the history of the attack and the symptoms exhibited, the diagnosis of the disease will usually present little difficulty. When symptoms of loss of appetite, rapid wasting, greatly diminished milk yield and constipation occur during early lactation, acetonaemia should be suspected. If in addition the characteristic odour of acetone is detected in the breath or should any of the nervous symptoms described make their appearance this will provide confirmatory evidence. It is, however, necessary to mention that an odour of acetone may occasionally be present in the breath of apparently healthy cows or in cows suffering from some other diseases and it is consequently unwise to place absolute reliance on this feature alone. In order to confirm the diagnosis, samples of milk or urine from an affected animal may be submitted

to a simple chemical test in which a positive result is denoted by a colour reaction. A strongly positive reaction considered in conjunction with the symptoms will serve to place the diagnosis beyond doubt. When confirmation is desired milk or urine samples may be forwarded to this Department for testing. The amount of each need not exceed a fluid ounce and the sample should be despatched immediately after collection, otherwise it may prove unsuitable.

Acetonaemia may be a complication of other metabolic diseases such as milk fever, or other conditions may be secondary to acetonaemia. In such cases diagnosis is not always easy but is important as treatment may also be required for those conditions.

TREATMENT

Many treatments have been described for acetonaemia and whilst most give reasonable results they have not always been successful in re-establishing appetite and milk production rapidly.

However, basing the treatment on the theory of glandular upset, A.C.T.H. injections have been most successful in this State and elsewhere and cows so treated mostly regain their appetite within 24 to 48 hours. In most cases one injection is all that is required. The use of A.C.T.H. is confined to veterinarians but its cost is not now so high as to preclude its use.

A treatment which can be adopted where veterinary services are not available is the injection of a 40 per cent. solution of glucose (approimately 7 oz. of glucose dissolved in 17 oz. of boiling water and allowed to cool). This is injected subcutaneously (under the skin) preferably in three or four different sites. A single injection may result in recovery but four or five injections repeated on successive days may be necessary before the desired result is obtained.

An alternative method of treatment consists of the adminstration of chloral hydrate, one ounce of which should be given night and morning for the first two days of treatment followed by half an ounce once daily for the next six days. In the administration of chloral hydrate the prescribed dose of the drug is dissolved in a pint of hot water and a pint of treacle or molasses added, the mixture being given to the cow in the form of a drench.

In the case of cows which are subject to annual attacks, molasses given in the ration at the rate of one or two pints daily for the first few weeks following calving may be beneficial.

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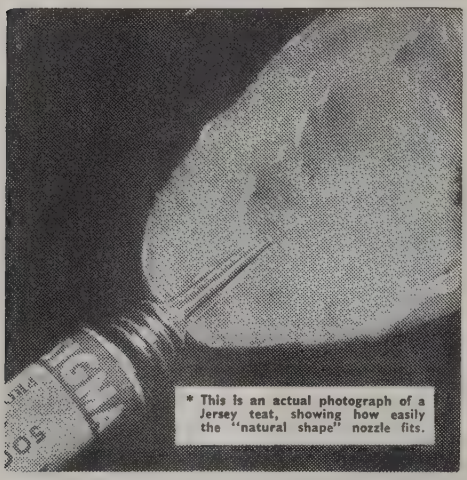

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WATER CONSERVATION ON THE FARM

Donnybrook Farmer's Ambitious Undertaking

By R. C. ROWBOTHAM, Horticultural Instructor

Fig. 1.—The main wall and portion of the excavation

THERE is no sounder guarantee of agricultural prosperity than an adequate supply of good water—a fact that should be fully appreciated at the present time when, following upon an unusually dry season, many farms are already experiencing water shortages. This description of the manner in which Wilfred Dilley and his son Beris, tackled their water conservation problems may serve as an incentive to other South-West farmers in similar situations.

The Dilleys have a mixed farm and orchard property at Upper Capel in the Donnybrook district. To guard against periodical water shortages they decided to dam a broad, rather shallow, creek bed which carried a small winter stream feeding into the Capel River. The average natural depth of the gully was from 6 to 7ft. but as, according to Mr. Dilley's calculations, the creek drains an area of about 20 square miles it appeared to be ample to fill a fairly large-sized reservoir.

Excavation was commenced in April, 1953, using a T6 tractor fitted with a 7ft. bulldozer blade. Approximately an acre of excavation was completed that autumn and a wall 12ft. high and 3¾ chains long was built across the gully, with wings following the natural curve of the gully running upstream for about five chains. The main retaining wall was 50ft. thick at the base, tapering to about 10ft. in width at the top and was built of good clay well pugged. A spillway was cut at one end of the main wall and this was faced with cemented ironstone.

Fig. 2.—Cutting a channel below the main wall to seal off old watercourses

The work occupied Beris Dilley and his

T6 tractor for about 130 working hours, during which they pushed up about 6,500 cubic yards of earth. When the dam was filled to overflowing it impounded almost seven acres of water which ranged in depth from 12ft. at the dam to about 6ft. higher up the gully. The capacity was estimated at about 11,000,000 gallgallons.

Fig. 3.—Some idea of the size of the excavation may be gained from this photograph showing Mrs. Dilley in the foreground

Being inexperienced in dam construction, the Dilleys soon found that they had made a few mistakes. Firstly, they had not stripped the over-burden before building the walls, and secondly, they had not allowed for the fact that in the bottom of the gully were some old courses of the stream partly hidden in the clay and filled with a porous sandy silt. Through these there was a continuous seepage under the wall.

To remedy these faults it was decided to pump the dam completely dry during the summer of 1953-54, the water being used to irrigate 16 acres of their orchard through a sprinkler system.

The dam was empty by February 11, 1954, and the Dilleys then decided to deepen the whole excavation by about 4ft., strip the walls and reface them to a greater thickness. To effectively seal off the old sand-filled water courses a channel was cut right across the bottom of the dam close to the foot of the main wall. This channel had to be about 7ft. deep and 13ft. wide and was filled with good clay. The foot of the reconstructed retaining wall was extended to overlap and completely cover the outer edge of this filled channel.

The new main wall is now 90ft. thick at the base and 17ft. in height. The wings were also raised about 4ft. and widened. To enable them to carry out this extra work the Dilleys decided to purchase a larger outfit and this part of the project, which entailed the moving of 14,000 cubic yards of earth was carried out with a TD18 tractor fitted with a 12ft. dozer blade. Beris and the TD18 put in 110 hours working time on this second phase.

Fig. 4.—The bulldozer working on the main wall

The capacity of the dam is now estimated to be about 17,000,000 gallons, but the Dilleys are not yet satis-

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fied. This summer they intend to empty the dam again, deepen the excavation still further to give a 20ft. depth of water at the dam which it is hoped will lift the capacity to something over 20,000,000 gallons.

This they consider should give them sufficient water to irrigate 30 acres of orchard up to three times, depending on the season, and to give them enough water for 30 acres of lucerne yet to be planted, and 10 acres of summer crop potatoes.

To this end they have already installed along the orchard fence 1,300ft. of main line and about 700ft. of portable sprinkler lines which will be added to later.

LEAD ARSENATE RESIDUES ON EXPORT APPLES AND PEARS

Growers, packers and exporters of fruit are reminded of the serious view taken by the various Health Authorities in the United Kingdom of lead arsenate spray residues on apples and pears. The Ministry of Food, Food Standards Committee, has recently reviewed the position and has recommended that all local Health Authorities uniformly enforce limits of 1.4 parts per million of arsenic trioxide and 2.0 parts per million of lead on apples and pears. It is therefore necessary that growers apply lead arsenate sprays at the minimum effective concentration and wherever possible use alternative sprays. In this respect later sprays are more likely to leave residues than early sprays and in particular lead arsenate should not be applied close to the picking date. It is not possible to set a final date which is necessarily safe as this depends on many factors including the number and the concentration of sprays applied, the amount of fruit growth and the climatic conditions following spraying. The use of an oil spreader is undesirable as it increases the risk of lead arsenate residues.

Growers and packers are advised that if an export inspector detects visible residues of any nature on lines presented for export the entire line will be rejected. Chemical analyses to check the level of residues will be carried out in all States throughout the season.

Every individual grower should realise that in this matter he has an obligation to the industry.

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PLANT DISEASES

ASCOCHYTA BLIGHT OF PEAS

By W. P. CASS SMITH
Government Plant Pathologist

THIS disease of peas which is generally termed "black spot" or "stem rot" by growers is widespread in Western Australia. During the wet winter months the disease is often so severe that it is difficult to grow garden pea varieties satisfactorily; but in summer when hot, dry conditions usually prevail the disease is of little consequence.

Ascochyta blight may be caused by a complex of three different parasitic fungi namely *Ascochyta pisi, A. pinodella* and *Mycosphaerella pinodes,* but the last-named appears to be commonest here. Although each of the three fungi produce somewhat different symptoms their life-histories are so similar, that they are here treated as the cause of a single disease.

The main symptoms will be familiar to anyone who has tried to grow peas during winter; the disease becomes obvious by the occurrence of a conspicuous black or purplish streaking of the lower stem portions, together with a very obvious spotting of the leaves and pods. When the disease is severe the basal stem portions may be completely rotted, causing the death of all above ground parts. In this case the black or purplish discolouration completely encircles the stem, and the lesion may extend several inches above ground level. (Fig. 1.) On the leaves the spots may take the form of small brown or purplish irregular dots,

Fig. 1.—Stem rot of peas. Note blackening of lower stem and withering of foliage

Fig. 2.—Ascochyta blight of peas, showing leaf and pod spot stages

or they may be large, more or less circular, and concentrically ringed. Similar lesions may also develop on the pods. (Fig. 2.)

The disease is seed-borne, and its first appearance in a garden can usually be traced to the planting of infected seed. Most commercial samples contain a proportion of infected seeds, and these are often badly shrivelled and discoloured with black, brown or purplish blotches. Culling out discoloured and shrivelled seed from the sample will considerably reduce the disease, but as a few infected seeds may be symptomless the disease cannot be elminated entirely by this means. (Fig. 3.)

However, growers can, if they wish, obtain clean seed by growing a special summer crop for seed purposes, as the disease is only serious in crops grown during the wet winter months. When saving seed, any pods showing discolouration should be avoided.

The sowing of infected seed gives rise to diseased plants, from which the disease may be transmitted to healthy plants adjacent by rain splashed spores. The disease can also arise from infected crop residues in the soil, or from wind blown spores from adjacent diseased crops.

CONTROL

(1) If practicable sow only disease-free seed harvested from a summer crop, or if this is unobtainable, carefully handpick

and discard all badly shrivelled, discoloured, or cracked seed.

(2) Dust the seed before planting with Tetroc (Spergon) or other suitable dusts at the rate recommended by the maker. Although seed treatment will not completely control the disease it often promotes a better emergence.

(3) Plant out on land which has not grown peas for two or three years, choosing a sunny, well drained, situation for winter crops.

(4) Support the crop well off the ground with stakes, strings, etc., so that it will dry more quickly after rain.

(5) Immediately the disease is noticed spray with a Thiram—containing fungicide at a dosage of 1½ lb. in 100 gallons (= 1oz. in 4 gallons) taking care to cover the stem bases thoroughly as well as the leaves. During weather favourable for the disease routine sprayings at approximately weekly intervals may be required to hold the disease in check. Thiram fungicides are sold commercially as "Thiotox," "Lantox," "Thiram 80," etc.

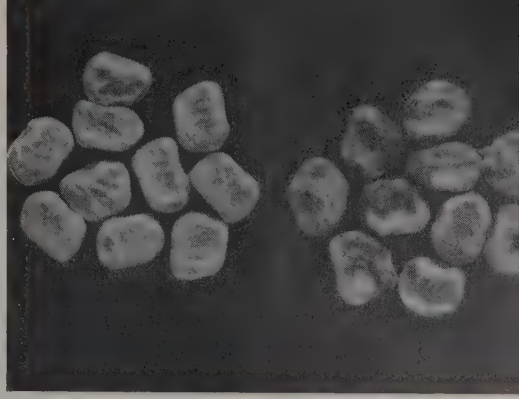

Fig. 3.—Good and inferior quality seed. Ascochyta blight is often introduced by infected or contaminated seed. Discoloured, cracked, spotted or shrivelled seed such as that shown at the right may carry the disease and should not be planted

N.B. In a recent spray trial Thiram and Phygon were the only fungicides whch proved superior to the standard copper oxychloride spray. Phygon however is not available locally. The following fungicides were inferior to the copper spray:— Ziram, Zineb, Captan, T.Z.U. 4311, and P.M.F. The P.M.F. spray was no better than the control and caused mottling of the foliage.

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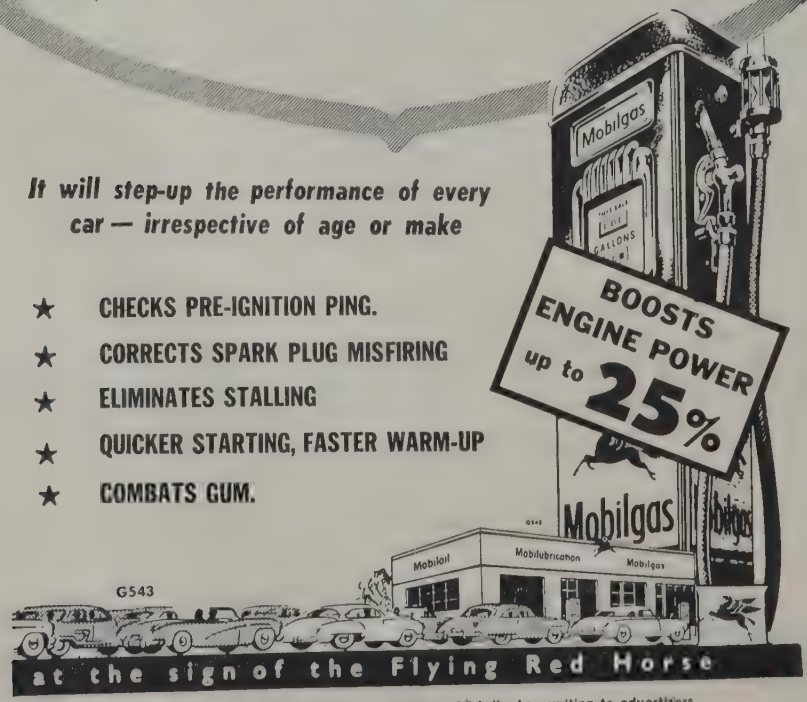

at the sign of the Flying Red Horse

A KANGAROO DISEASE

INVESTIGATIONS INTO "LUMPY JAW" ON THE MURCHISON, 1954

By A. R. TOMLINSON, Chief Vermin Control Officer, and C. G. GOODING, Vermin Control Research Officer

Fig. 1.—Head of diseased kangaroo showing swollen jaw.

IN March, 1954, a survey of part of the Murchison area was undertaken by Messrs. Gooding and Harrison, Research Officers of the Agricultural Protection Board, to investigate a reported outbreak of disease among kangaroos—predominantly Marloos, also known as Red or Plain Kangaroos (Macropus rufus)—which inhabit those areas. At the time the disease was not known by any special name so the name of "Lumpy Jaw" was officially adopted. Upon their return to Perth, these officers sent out a questionnaire to 67 pastoralists in the area, asking for information on the disease. Only 20 replies have been received but, from these, a lot of useful information has been obtained.

The earliest report available to this Department is that the disease was seen as long ago as 1918 on Twin Peaks Station in the Murchison and then again in 1927 on Minara Station in the Eastern Goldfields pastoral area. Outbreaks in the Murchison were reported again in 1928, 1935-6 and 1952. It seems that the disease in the kangaroo populations of those areas has been present for a very long time and that outbreaks of the disease have been, more or less, frequent for at least the last half century.

From pastoralists' replies to the questionnaire, it appears that the latest outbreak of the disease was first noticed about December, 1953, and continued until about March, 1954, having reached a peak in January or February, 1954.

AREA AFFECTED

Reports of the disease have come from properties as far apart as Berringarra, Edah, Youno Downs and Mooloogool, which embraces approximately 17,250 square miles of country centred on Cue and Meekatharra.

Besides these, reports have come in from two stations outside this belt and approximately 200 miles to the North-West of Meekatharra.

It will be remembered that pastoralists in the Meekatharra area were hard-pressed to sustain their sheep last season prior to the drought-relieving rains which fell in June. It seems highly probable that these dry seasonal conditions were playing a big part in assisting the incidence of the disease.

SYMPTOMS

The symptoms of the disease were many and varied and included the following noticeable features:—

(a) Infected mouth, including grossly swollen, gangrenous tongue and jaw abscesses, which caused exterior swellings (hence its name).
(b) A watery discharge from eyes and nose.
(c) Swellings on varying parts of the body. Some such swellings, which contained a copious amount of pus, were found on the thigh bone

Fig. 5.—A close-up of the leg of the animal shown in Fig. 2. Note the swelling indicated by the arrow. These swellings contain pus.

soda to two parts of arsenic (by weight) and is procurable ready mixed.

The method of preparation is to use either 1½lb. of ready-mixed arsenite of soda, or alternatively 1lb. white arsenic and ½lb. washing soda. Add this to 1 gallon of water and boil until dissolved, keeping the mixture well stirred as it will boil over readily. Next add 1lb. sugar and stir until dissolved. This stock solution can be diluted to make 30 gallons of poisoned water.

After using the poison, the troughs should be well flushed with clean water before stock are allowed access to them.

ACKNOWLEDGMENTS

The authors' thanks are due to Mr. Geoff. Sharman of the Zoology Department, University of Western Australia, for his help in the field, and to Mr. J. E. Peterson of the Animal Health and Nutrition Laboratories for his work in connection with the identification of the causative agent, and for supplying much helpful advice concerning the possible methods of transmission.

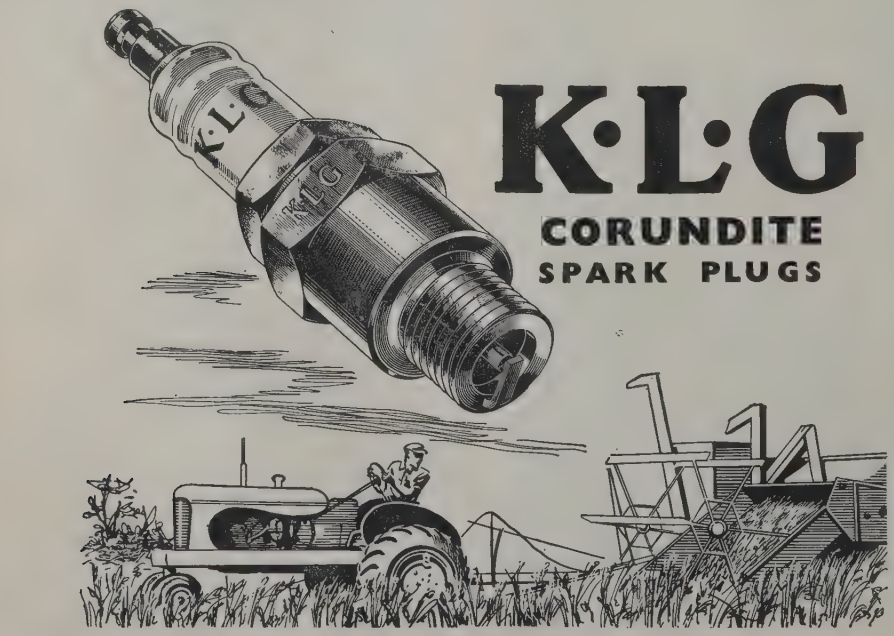

Fig. 1.—Topography such as this is typical of the lower South-West. Note the bracken on the distant hill-slopes.

RABBIT CONTROL WITH "1080"

Experiments at Manjimup, January-July, 1954

By A. R. TOMLINSON, Chief Vermin Control Officer; C. MARSHALL, Senior Vermin Control Officer; and C. D. GOODING, Vermin Control Research Officer

THE lower South-West areas have for some time past been regarded as perhaps the most difficult areas in Western Australia from the point of view of rabbit control. The farmer here has to contend with several factors, peculiar to this area, which make his work more difficult. Such obstacles as bracken fern, falling timber, good burrowing soil and a long breeding season combined with small holdings, lack of rabbit control experience, partial use of the cleared areas (tobacco and potato growers) and a low income potential, have rendered the task of rabbit control exceedingly difficult for the average farmer, especially in the Manjimup-Pemberton areas.

It was with all these difficulties in mind that Manjimup was chosen as the site for our initial experiments and also for the start of an organised drive by Government trained teams in the coming year.

WHAT IS "1080"?

"Ten Eighty" (Sodium fluoroacetate) is a poison developed in America principally for use against rats and mice, but which proved remarkably effective against the coyote, an animal whose depredations are somewhat similar to those of our dingo or wild dog. So successful was the use of 1080 in this sphere that talk is now afoot to have the coyote protected in some areas, lest it should die out completely.

It was with this experience as a background that initial supplies of this poison were obtained from America for testing as a rabbit poison. Some initial tests were conducted by C.S.I.R.O. in the Eastern States followed by a wholesale scheme instituted in Tasmania in 1952.

The outstanding features of "1080" are these: It is tasteless, odourless, does not oxidise or form harmless substances, but

Fig. 2.—Paddock like this are common around Manjimup. Note dead timber and stony ground.

dissolves readily in water. This means that it is an ideal poison for vermin control purposes for the following reasons:—

(a) Animals cannot taste the poison (unlike strychnine or arsenic, for example.)

(b) Animals will not build up any bait shyness or become "educated" to it.

(c) It is very easily prepared and handled in water solutions.

(d) It is exceptionally deadly and once symptoms have set in, there is no possible chance of recovery.

(e) It is slow in its initial action so that animals will take baits and move away before dying. This means that late arrivals will not be frightened away from the furrow.

These characteristics also make is very dangerous from man's point of view. The makers have recognised this, and will only sell to responsible Government authorities who in turn are under strict rules, imposed by the manufacturers and the Health Department, for its control and use.

ORTHODOX METHODS

A group of farms in the West Manjimup area was chosen and subjected to orthodox methods of rabbit control. These consisted of either phosphorus poisoning, or the use of strychnine and oats. Results from both these methods were poor compared with those from "1080," but would constitute results a little better than those usually obtained by landholders.

However the important point is that on each of these properties a good residual nucleus would normally have been left to start another infestation as soon as breeding commenced in the winter months. In these cases this was avoided, as a later poisoning with "1080" reduced the population on all these properties to negligible proportions. Later inspections have shown that these properties are still free of rabbits.

A test was designed with the object of comparing the relative palatability of "1080" and phosphorus. The latter is thought to have some attraction during the dry summer months, but 54.4 per cent. of the "1080" baits were consumed compared with only 25.4 per cent. of those containing

phosphorus. Thus baits containing this new poison are twice as attractive as those containing phosphorus.

"1080" TESTS AND RESULTS

The outstanding fact emerging from all the work at Manjimup is that results with "1080" can be consistently above 90 per. cent. and near to 100 per cent. Both apples and oats can be used with equal effectiveness during the autumn and early winter months. Oats however gave better results in the late winter and early spring. In the winter months the poisoned oats not consumed by rabbits will germinate within a few days (if unboiled) and this renders them non-toxic, making the paddocks safe for stock. The green shoots were tested and shown to be harmless to rabbits and stock. In the hotter weather, apple is a much safer bait material since it withers away in the hot sun within a few days.

It has been shown that it is still necessary to "free feed" at least three times. This is a bare minimum, and where it is suspected that all rabbits are not yet feeding at the trail, the feeding should be continued until this is reached. In one area in Tasmania the consumption had been increasing until the ninth day while in others it was shown that seven days was the optimum. These figures could well apply in areas such as Manjimup, but are not recommended, as rabbits might become weary of the furrows by that time.

We have shown that it makes little difference whether oats are placed in the furrow or on the top of the ground, adjacent to the furrow. In both cases the results were the same, but results might be achieved a little sooner if the oats were placed in the furrow.

The width of the furrow was also tested as a lure factor. It was shown that no difference in consumption occurred from furrows varying in width from $3\frac{1}{2}$ to $7\frac{1}{2}$ inches which are the only sizes within the realms of practicability for a disc plough.

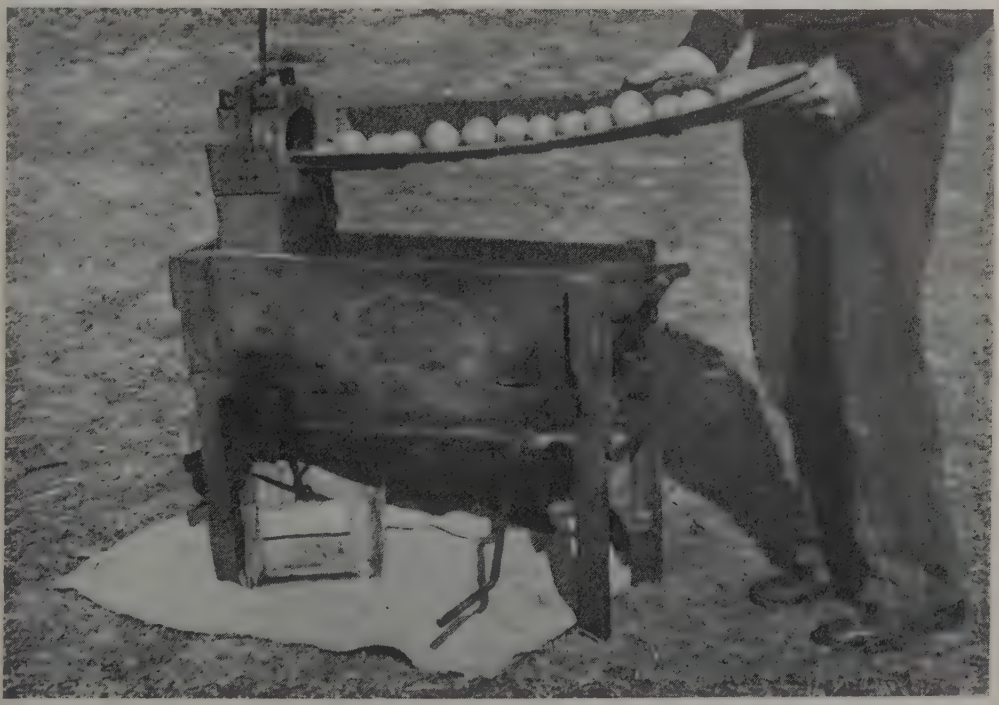

Fig 3.— A hand-operated apple cutter.

Fig. 4.—Operating the apple-cutter.

SECONDARY POISONINGS

A noticeable feature of the poisonings carried out in the Manjimup area was the almost complete absence of secondary poisonings of native fauna, or the poisoning of birds with grain. (Birds are, in general, very resistant to "1080"). Foxes have been very hard hit in the areas poisoned with apple bait. Some farmers report that foxes have almost disappeared from their area following the use of this poison. These deaths have, in most cases been due to foxes picking up the apple straight from the furrow, rather than from any secondary effects.

CONTRACT POISONING

Besides the purely experimental work detailed earlier, a limited amount of contract poisoning was carried out for farmers. Approximately 70 farmers came into the scheme and had work carried out on their properties. A questionnaire was attached with each account requesting fundamental details. Twenty-nine of these have been completed and returned. Of these 28 state that they are entirely satisfied with the work carried out on their property, while 25 state that the results are better than any ever achieved on their properties previously. Farmers were asked to sign a form exonerating the Agriculture Protection Board from any liability through loss of stock or other causes. The free-feeding was carried out by the landholder under supervision, while the actual poison laying was done by members of the Government staff and a charge made to cover this cost.

It can be appreciated that the organisation involved in the smooth functioning of several teams of men (who must be kept fully occupied, if costs are to be reasonable) are immense and involves a lot of planning.

OVERALL RESULTS

Taken as a whole, the results achieved with "1080" in the Manjimup district have been bordering on the spectacular. One can travel several miles in areas like Middlesex, which previously was heavily infested, and not see a single rabbit on the road now, whereas last January one would have expected to see anything up to one

Fig. 5.—Laying apple baits poisoned with 1080 in a furrow. Note that the bait-layer is wearing rubber gloves.

hundred. The feed in the areas poisoned first is now beginning to show the benefit of a season free of rabbits. One farmer reports that his cream cheques are bigger this year from 11 cows than from 21 last year. This increase he attributes entirely to the lack of rabbits. Inspection of a large property east of Manjimup, which for years has been described as badly infested, revealed only one rabbit on this property, and he ran under the homestead for protection.

A reliable, well-informed resident in the area who has had a lifetime of experience with rabbits in Manjimup, states that with the small amount of work done in the district last autumn the average rabbit position is now better than it has been for several years past. When the wholesale scheme gets under way in the coming season it is hoped that the first stages in a more successful war against the rabbit in the lower South-West areas will commence.

ACKNOWLEDGMENT

Many thanks are due to the Manjimup Vermin Board who through the agency of their Vermin inspector Mr. W. Rooney, provided much valuable assistance with all the experimental and contract poisoning work.

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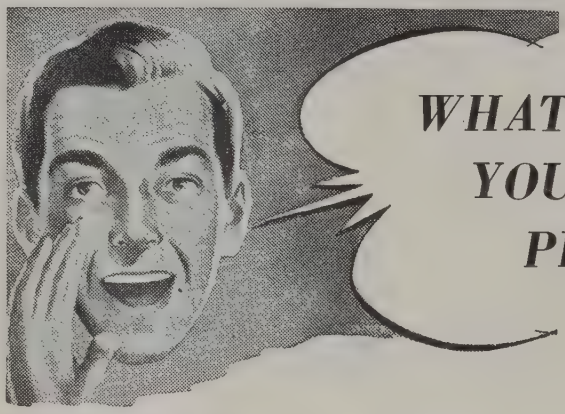

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PREPARING AND USING Rawhide

By J. A. Mallett.

UNTANNED bullock or horse hide—usually known as rawhide or greenhide—has played an important role in agriculture in many countries for centuries. It needs little preparation and combines tremendous tensile strength with light weight and durability, so is an ideal material for many farm uses.

The Boer pioneers in South Africa probably used rawhide more extensively than any other community and developed considerable skill in its preparation.

They used rawhide to make ropes, whiplashes, harness, footwear, saddlebags, buckets and many other articles of farm equipment.

Rawhide thongs or "riems" were used in place of fibre ropes, and were plaited or woven to make chair-seats or laced across beds to make mattress foundations.

Apart from the heavy hides used for such purposes, the skins of deer and antelopes were often worked to silky softness. The "buckskin" of the American Indians was another form of rawhide.

DEHAIRING

In the preparation of rawhide, the first task is to "flesh" the hide to remove all scraps of flesh and tissue adhering to the inner surface. The next task is to remove the hair.

The Boers accomplished this by permitting a certain degree of decomposition to take place. If the hide had been allowed to dry after flaying, it was first soaked in rainwater until soft. Newly-flayed hides do not require soaking.

The hide was then folded, hair side inward, and buried in moist earth or in a manure-heap, being exhumed and tested at frequent intervals. The hair on the belly portion of the hide is usually the most firmly attached, and when this began to "slip" freely, the hide was taken out, scraped to remove the hair, and then washed free of objectionable matter.

The Bran Method.

A method of de-hairing recommended by "The Handbook for Farmers in South Africa" is to immerse the hide in a sloppy mixture of wheat bran and rainwater, rubbing this well into the hair. The hide is then taken out, folded and placed in a tub for 24 hours or until the hair comes away freely.

With the bran method there is less risk of damage to the tissues by rots and grubs, also the skin has a whiter, cleaner appearance and less objectionable odour than when dehaired by the other methods described above.

Dehairing with Lime.

Hides may be de-haired rapidly by the use of lime, but this method has a tendency to make the finished product too dry and reduce its strength.

About ½ lb. of builder's lime (quick lime) is used to each gallon of water. The lime is first slaked, then dissolved in the water. When the solution is cool, the hide is immersed and left soaking until the hair comes away freely. While in the limewater, the hide should be moved around frequently to allow the liquid to reach every part.

It should not be left in the solution an hour longer than necessary and should be thoroughly de-limed by washing in several waters. A weak acid solution such as a pint of vinegar to three pints of water is often used to neutralise the lime. A less attractive method is to immerse the hide in a solution of fowl manure.

BREYING

The operation of twisting and working the hide to make it soft and supple is known in South Africa as "breying" and is usually achieved by means of a "breying block". (Fig. 1.)

This is a log weighing about 100 lb. with a curved handle lashed to it. The hide is commonly "breyed" by cutting it into a continuous strip. The thin flanks and other uneven portions of the hide are trimmed off so that it presents a roughly oval appearance, then the cut is made round and round in a spiral.

The breying block is lifted on to a box or table of suitable height and the strip of hide is passed through the handle and up over a beam or branch of a tree, then back through the handle and over the beam again until the required number of turns are completed when the ends are tied or laced together.

The box is removed so that the strip of hide takes the full weight of the block. A pole is then thrust through the handle of the block and the operator walks round and round until the hide is twisted into a tight spiral.

On withdrawing the pole, the block descends, spinning at high speed and its momentum continues the spin in the reverse direction. As it steadies, the pole is thrust into the handle again and the hide is twisted up tightly until the block is again released.

The breying is continued for many hours, the strip being moved round at intervals to ensure that the portions which were round the beam and the handle are thoroughly worked.

As the moisture is squeezed out of the hide by the twisting, the strip is liberally smeared with mutton fat and the breying continued until the hide is soft and pliable throughout its length.

The flanks of the hide are thinner than the back portions, and these are often treated separately, either in strips or in the piece. Even a whole hide may be breyed intact by punching holes in the ends which are then laced together with rawhide thongs.

Variations in the thickness of the hide make it difficult to treat a whole hide satisfactorily however and it is best to cut the hide into pieces or strips of even thickness and brey these separately.

The flank portions or thin skins from smaller animals may be breyed and softened by working them backward and forward over a blunt axe-head or similar tool, set in a vice.

Fig. 1.—A "breying block" used for treating rawhide.

PLAITING

A person with a knowledge of plaiting can greatly extend the sphere of usefulness of the rawhide strips. The diagrams (Fig. 2) show the basic principles governing some of the simple plaits, taught to me many years ago by Mr. L. T. Smith, of Manjimup, a leather-working hobbyist of considerable skill.

In the diagrams, the different strands are shaded to assist in identifying them, and the plaits are shown loose and open for the same reason.

In actual plaiting, the strands should be tightly interwoven with no daylight showing between them.

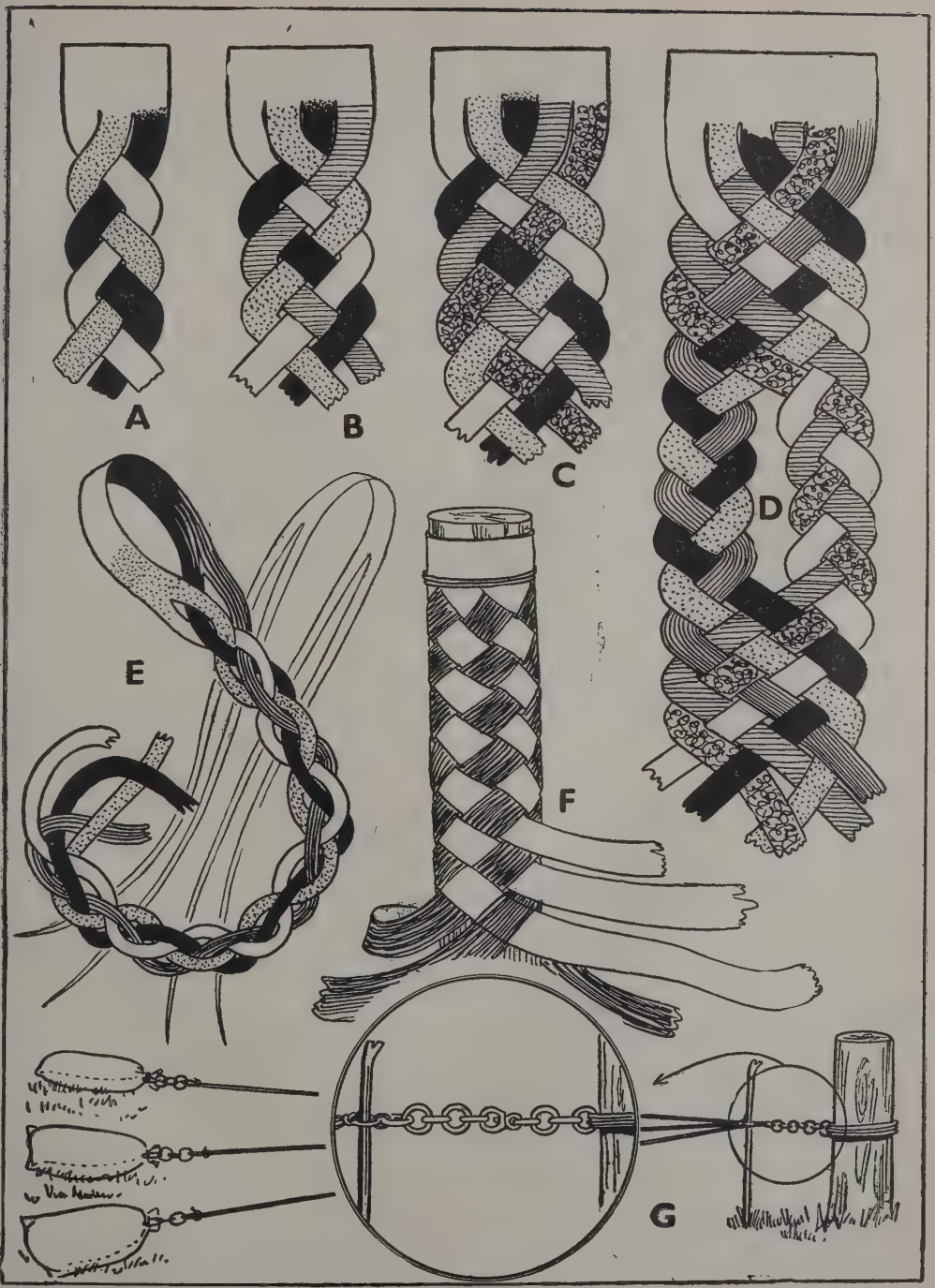

Fig. 2.—A, B, C: Three, four and five-strand flat plaiting; D: Six-strand flat plait with buttonhole; F: Plaiting round a stick using simple "basket weave"; E: Four-strand chain plait; G: Method of making a three-strand twisted rawhide rope.

Flat Plaits.

Most people are familiar with the simple three-strand flat plait (A). In the four-strand plait (B) we merely follow the same principles of "over one and under one", crossing the two centre strands first; bringing the left-hand strand over to the right and the right-hand strand over to the left.

As each strand in turn comes to the outside edge of the plait, it is bent back, over or under the adjoining strand and is carried over towards the opposite side.

Practise with the four and five-strand plaits, using fairly wide strips and plaiting loosely, until the principles are mastered, then try the six-strand and wider plaits.

One can introduce variation by switching from a six-strand to two three-strands and back again to form a buttonhole (D) or one can form a ridge down the centre of the weave with any of the eight, ten or other even-numbered plaits.

The ridge is made by crossing the strands in the centre and taking them back to their own side again instead of going diagonally over to the opposite side —in effect, we have two four-strand, or five-strand plaits that are joined by linkage in the centre.

Round Plaits.

After mastering the flat plaits, one can learn to apply the same principles to the covering of a round stick such as a whip-handle. Usually six or more strands are spaced equally round the stick or core and held in position by a wire or strong rubber band (F).

Once the "basket weave" or "under one and over one" is mastered, one can experiment with variations like "over two and under two", "over two and under one", etc.

To finish off the plait, the strands are tapered and turned back into the weave, paralleling the original pattern.

There are hundreds of different ornamental plaits with "Turk's Heads" and other types of terminals and sliding keepers, but they are beyond the scope of this article.

A useful book for those who wish to pursue the subject further is "The Bushman's Handcrafts" by R. M. Williams, which may be obtained from Perth booksellers (Price 22s. 6d.). It contains much useful information on plaiting with leather and horsehair, tanning skins, making moccasins, shoeing horses, working in horn and bone and similar information for the outback hobbyist.

Chain Plaits.

Before leaving the subject of plaiting, there is one other plait that might be mentioned as a simple method of making ropes or whips.

This is the "chain plait" using four strands as shown in Fig. 2 (E). For a whip, a long strip of rawhide is split down the centre from each end, leaving about 6 in. unsplit in the centre to form the loop by which the whip is attached to the handle. The four thongs should taper slightly towards the centre loop, then swell out wide to form the "belly" of the whip and again taper off gradually to the end of the lash.

The thongs are crossed in pairs as shown in the sketch and produce a round plait.

In all plaiting where it is necessary to splice in extra pieces to give added length, the strands should be of different lengths so that all the splices are well separated.

To splice, the thongs are tapered off and a similarly tapered thong is plaited in for several weaves.

TWISTED RAWHIDE ROPES

Rawhide ropes made by twisting three strands together are widely used on cattle stations in Northern Australia.

A freshly-flayed hide—preferably a cowhide as these are usually fairly uniform in thickness—is pegged out on the ground.

It should be carefully flayed, free from nicks and without scars, tick-marks and severe branding which might weaken the tissues.

Cutting the Hide.

The hide should not be tightly stretched —merely held fairly firmly.

A circular piece about the size of a saucer is cut from the centre of the hide, and then, using a sharp knife, a continuous strip of hide about ¾ in. wide is obtained by cutting round and round the hole in an ever-increasing spiral.

The strip should vary slightly in width according to the thickness of the hide. Where the hide is thickest such as on the back, the strip could be five-eighths of an inch wide. On the thinner neck and flank parts, it could be seven-eighths or more.

Unless a particularly long rope is needed, it is better to reject the thin portions of the hide. Should they be included, see that the thin portions are farthest from the terminal ring and are twisted with one or two strands of thick hide.

Preparing the Strands.

The strip of hide is now folded to give three equal lengths, one length being cut free. If the original strip is about 90 ft. in length it will twist up into a 25 ft. rope.

Take a good strong ring and tie the loose strand to it with two half-hitches, leaving a loose end about 8 in. long and tapered off so that it can be spliced into the rope. Take the remaining two strands and hitch the doubled portion over the single strand making sure that the ends are level.

Now obtain four hobble-chains or other suitable chains with swivels. One is securely lashed to a tree or stout post at a height of about three feet from the ground and the ring with the three strands tied to it is firmly secured to the hobble-chain with wire or a rawhide thong.

The other three hobble-chains are attached to three heavy weights. These can be logs, bags of sand or any suitable material but should be of equal weight (about 1 cwt. each).

The three thongs are each attached to one of the weighted hobble-chains and the outfit is set up as shown in the diagram on a piece of smooth level-surfaced ground where the rope will not be interfered with when left to dry.

We now have the anchor post to which the hobble-chain is securely tied. The ring carrying the three strands is wired to the end link of the hobble-chain, and a crowbar or long peg is passed through this ring and hammered into the ground to keep it from twisting.

The other ends of the strands are tied to their respective hobble-chains which are in turn attached to the weights. The weights are moved away from the anchor-post until there is a slight strain on each strand. The weights should be separated at regular distances apart to give the operator or operators room to work.

Twisting the Strands.

A peg about a foot or 18 in. long is thrust through a link of one of the weighted hobble-chains in front of the swivel and used as a lever to twist the strand. As twisting proceeds the weight will be drawn forward, and it is essential that the ground should be smooth so that the weight moves steadily and not jerkily.

Continue twisting until the strand begins to knot up in lumps, then ease off and secure by driving the peg into the ground.

Repeat the process with the other three strands, twisting them all in the same direction.

If extra operators are available, three strands may be twisted simultaneously and in this case a long bar passed through a link of chain on each strand will hold the rope and prevent the strands from untwisting.

Twisting the Rope.

When all the strands have been twisted evenly and secured, take a large pair of blacksmith's pincers and move up to the anchor post.

The handles of the pincers are thrust between the three strands near the ring and the crowbar is removed from the ring.

Holding the pincers in both hands by the nose and the handles, the operator then moves them slowly back towards the weights. The rope should twist of its own accord.

Should one of the strands be insufficiently twisted, it will be forced out of place at this stage and will lie on top of the other two strands instead of forming an even triple twist.

If this should occur, untwist the rope again by means of the crowbar or long peg thrust through the ring and give the defective strand a few extra twists.

Should the rope not twist freely of its own accord, the hobble-chain swivel at the anchor-post may not be working freely or alternatively the strands may be insufficiently twisted. The remedies are obvious.

If the rope twists properly, move the pincers slowly down to the weights and then withdraw them.

Now move back to the anchor-post end of the rope and, by means of the crowbar or long peg through the ring, twist the rope still more until it is tight and hard.

Drive the crowbar into the ground again and leave the rope to dry. It will sag after a day or two but do not try to remedy this by twisting the rope any more, otherwise you will always have a rope with loose strands.

Give the rope a dressing of weevil paint to prevent damage during the drying period, and leave for three weeks or more; the longer the better. The rope should not be allowed to get wet at this stage so do not try rope-making during wet weather.

Scrape the rope with a sharp knife or piece of glass to remove surplus hair, and before using, rub in a mixture of two parts of unsalted fat to one part of Stockholm tar.

Work the rope backwards and forwards over a beam, or tie it behind a vehicle and let it drag, to make it soft and pliable. The more it is used the more supple it will become.

FREE BOOK ON GENETICS

The Department of Agriculture still has a few copies of Dr. A. L. Hagedoorn's booklet "A Geneticist Talks with Australian Animal Breeders," and will make them available free of charge to farmers.

Dr. Hagedoorn, the famous Dutch geneticist, visited Australia in 1949 and gave over 80 talks to farmers and stockbreeders.

In this booklet, the publication of which was sponsored by the Commonwealth Scientific and Research Organisation, the main points of his talks have been placed on record together with a selection of the many questions asked at his lectures and the answers given by him.

Farmers wishing to obtain copies should apply without delay to The Publications Officer, Department of Agriculture, St. George's Terrace, Perth.

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FOOTROT (FOULFOOT) OF DAIRY CATTLE

By C. R. TOOP, B.V.Sc., Chief Veterinary Surgeon

ALTHOUGH it cannot be regarded as a disease of serious economic importance, footrot in cattle may at times become a source of considerable loss to individual dairy farmers. The occurrence of the disease is usually confined to a small number of isolated cases which may make their appearance in the herd during the course of the season, but sometimes it assumes what has been described as a contagious form in which a large number of animals may become affected in rapid succession.

The disease is caused by infection with the necrosis bacillus *(Fusiformis necrophorus)* which is widely distributed in nature and is frequently present in the soil in the vicinity of cow yards. It gains entrance to the tissues of the foot through small wounds and abrasions and is apparently also able to invade tissues which have become softened by constant exposure to mud and water.

The majority of outbreaks of footrot consequently occur during winter when conditions underfoot are wet and muddy, but the disease is by no means confined to this period.

During recent years many quite serious outbreaks have been encountered during the summer months and it is presumed that the feet have become wounded or abraded by contact with sharp objects or rough surfaces and that infestation has subsequently occurred by contact with contaminated mud in the vicinity of dams or water troughs or from organisms which have persisted in the dry soil.

SYMPTOMS

Affected animals show symptoms of lameness, at first slight, but later becoming severe and this is accompanied by rapid loss of condition and a marked drop in milk production. The lameness is usually confined to one limb, but both fore and hind feet appear to become affected with equal frequency. The affected foot is inflamed and swollen to the level of the fetlock. A close examination will in most cases reveal necrosis or sloughing of the skin between the claws and the presence of a purulent discharge. In some cases an abscess may form above the coronet and unless opened and drained may eventually rupture.

In old-standing cases in which the joints and tendons have become involved there is chronic lameness and permanent enlargement of the extremity.

TREATMENT

Prior to the advent of the sulpha drugs, the treatment of footrot presented a difficult problem. Recovery was usually slow and in the meantime a marked loss of condition and milk production occurred. The treatment recommended consisted of the immersion of the affected foot for several hours daily in a warm antiseptic solution, but this method was seldom applicable under practical dairying conditions. A more practical approach consisted of the application of a mixture composed of Stockholm tar 1 pint, finely powered bluestone 1 ounce, lysol 1 ounce, to the affected parts with a stiff brush after thorough cleansing of the foot and the removal of necrotic tissue. It was necessary to repeat this treatment twice daily and to keep the animal on clean dry ground until recovery occurred.

It has recently been shown that a satisfactory response in the treatment of footrot in cattle may be obtained from the administration of certain of the sulphonamides which renders local treatment unnecessary.

Sulphamezathine.

Sodium sulphamezathine 33⅓ per cent. solution is the drug of choice. This preparation is now freely available in bottles of 100 c.c. and 500 c.c. from chemists and livestock agents. The dosage for adult cattle is 100 c.c. administered by subcutaneous injection. This injection should be made beneath the skin of the neck or behind the shoulder using a syringe or injec-

tion apparatus of suitable capacity. A four ounce metal syringe fitted with a short length of rubber tubing and a 12 gauge needle or a milk fever injection outfit may be found convenient for the purpose.

Sulphamezathine is non-irritant to the tissues so that the development of a swelling or abscess formation at the site of injection need not be feared. Following treatment, a marked improvement in the condition of the animal will be observed within 48 hours and by the end of the third day, recovery in the majority of cases will be complete. Should the response not be satisfactory, treatment should be repeated after an interval of three days. The cost of each injection is about ten shillings, but when treatment is undertaken early no loss of condition or of production need occur and the saving thus effected will more than offset the expense involved.

Equally good results may be obtained from the injection of sodium sulphapyridine in a dosage of 60 grams (2 oz.) dissolved in 500 c.c. of water. This preparation must however be given by intravenous injection and it is consequently not suitable for use by the dairy farmer.

Satisfactory results have also been reported from the use of sulphanilamide, given by the mouth in a dosage of eight ounces and repeated at intervals of three days when necessary. This drug does not however appear to be so reliable as sulphamezathine and its administration is not so convenient.

PREVENTIVE MEASURES

It is difficult to recommend any effective method of prevention. Sharp objects which are likely to injure the feet should be sought for and removed. Approaches to gateways and lanes should be built up and yards should be paved so as to avoid exposure to foul, muddy conditions. The application of a heavy dressing of slaked lime in the vicinity of entrance or exit gates has been advocated, but this appears to be of doubtful value. A concrete foot bath containing a 10 per cent. solution of bluestone (1lb. bluestone to the gallon of water) at the entrance to the milking shed may in some cases be found helpful.

(Reprinted from "The Journal of Agriculture of Western Australia," Vol. 27 (Second Series), No. 3, September, 1950.)

The Exquisite Camellia

By C. C. HILLARY

OF all the shrubs grown in the gardens of Western Australia today, I doubt if there is one with greater beauty than the camellia. Exquisite when in bloom, the plants still excite admiration by the beauty of their highly-polished, almost mirror-like, dark-green foliage when the flowers are absent.

And how lovely indeed are the flowers! Some, so perfect in form that they hardly seem real; others with charming ruffled centres after the style of paeonies and others, again, with petals so tightly packed that they remind one of the New South Wales waratah. Indeed, there is one fine variety named Red Waratah, which is widely grown throughout Australia.

A LONG-LIVED PLANT.

Camellias live for a very long time—just how long no-one seems to know for certain. The oldest camellias growing in this State were thriving when the Franco-Prussian war was being fought. They have long outlived the pioneers who brought them from England, planted them, and gave them the loving care they needed in their new environment.

That was more than 90 years ago and still these lovely shrubs, one might almost call them trees now, go on flowering, year after year, for the pleasure of all who enjoy the company of noble plants. These particular camellias are growing in rich, alluvial soil in an old-fashioned garden established by Captain Theodore Fawcett of the 6th Dragoon Guards on the banks of the Murray River, Pinjarra, way back in 1862.

The tallest of them must be over 30ft. high. It is the lovely old-fashioned variety named Loweii, a formal type with pink flowers flecked with white. Another is Lady Hume's Blush, which has nicely formed blooms in the palest shade of pink. Yet another has been identified as Valtevareda, a charming formal camellia in a medium shade of pink.

In other gardens, too, there are camellias of 50 and more years of age. One of them lives in an old garden in the hills near Karragullen. It is a fine specimen of Great Eastern, that lovely deep red camellia with a white blotch which is sometimes known as Emperor variegata.

I have mentioned the long life of the camellia, so that those who buy and plant them will choose their positions carefully, realising that they are planting as much for posterity as for themselves.

KEEP THE ROOTS COOL.

One great thing in favour of camellias is that they are easy plants to grow. In some towns in Spain they are even used as small street trees. With their roots below the flags where the soil is always moist and cool, they thrive quite well despite their exposure to maximum quantities of sunshine.

Camellias certainly have likes and dislikes, but who hasn't? They like an acid type of soil; they dislike lime in any form. They (or most of them) prefer a certain amount of shade in the afternoon to full sunshine all day. They also like a cool, moist root run and dislike hot, dry soil around their roots. That sums up their likes and dislikes—not many really, are there?

The most suitable soil for camellias is a nice friable loam, but they grow quite well in gravelly ground and in sand, provided the sites chosen for the shrubs are well enriched with old animal manure or well-decayed vegetable matter. Whatever the ground, however, it should be dug and enriched to a depth of 18in., since the plants root deeply when the soil conditions are favourable.

FEEDING THE PLANTS.

It is most important that lime in any form should not be used. Wood ashes are also unsuitable since they contain a proportion of lime. Camellias thrive best in acid soils with a pH value of from 4.5 to 5.5. Soils with a higher pH value should be dressed with aluminium sulphate. If applied two or three months before planting, a tablespoonful to the square yard may be used. When applied after planting, the quantity should not exceed a dessertspoonful to the square yard and this amount may be applied twice a year if considered necessary. The acidity of the soil can be maintained by the use of decayed lawn clippings and other grasses.

Camellias like nitrogen and other foods just as much as other plants, though years ago we were advised to the contrary. Once they are established in the garden, they may be fed two or three times a year with blood and bone or fowl manure. They thrive well on both.

When blood and bone is used, two, three, or four handfuls should be scattered around each bush according to size. It should not be dug into the soil, but very lightly scratched into the surface with a small fork or rake. When fowl or pigeon manure is used, it should be placed around the plants in the form of a mulch one inch thick. It must not be dug into the soil, but left on the surface, then every time the plants are watered, some of the nourishment in the manure will be washed down to the roots. When placing fowl manure around a camellia, always keep it 6in. away from the main stem.

While some varieties of camellias will grow in full sunshine, in this climate most of them thrive better when provided with a certain amount of shade from the hot, afternoon sun in summer. Even those that grow in full sunshine usually lose much of their fine appearance towards the end of summer, the foliage, instead of remaining a rich green, assuming an unattractive yellowish colour. The young flower buds, too, are often scorched when subjected to too much heat.

When choosing the position for a camellia, the question of height should also be considered. Many plants will grow to 10ft. within eight or nine years when both the site and soil are favourable.

Of even more importance, perhaps, than soil and position is water. Camellias simply will not thrive in dry soil. They must have a cool root run and plenty of moisture around the roots at all times. A cool root run can be assured by placing a thick mulch of some kind around the plants in summer. Those living in hot, dry areas, where water is limited, can still enjoy the beauty of camellias by growing them in pots and tins in bush houses or on sheltered verandahs.

The variation that often occurs in the flowering of camellias is really most fascinating. There are plants which produce flowers of one colour on one side of the bush and blooms of another colour on the other. Sometimes a pure white variety, such as Purity—one of the loveliest formal camellias in existence, will have petals with pink blushes. Others, again, produce large flowers on one side of the bush and smaller flowers on the other. Further

variations occur, sometimes they become permanent, and on other occasions they are seen once or twice and then disappear.

Many varieties throw sports of a different colour and sometimes of different shape. There is evidence that plants of the same variety, growing in widely separated countries, have thrown precisely similar sports at about the same time. This has caused confusion in nomenclature, because the sports in each country were given a different name.

Interested bodies in Great Britain, the United States, Australia and New Zealand are now endeavouring to clear away this confusion and put the naming on a basis which will eliminate all surplus and unnecessary titles.

I hesitate to suggest varieties as I think all camellias are beautiful. Perhaps the best way to start a collection is to buy the plants when they are in bloom. You will then be sure of getting the kinds that please you most.

A few varieties I would recommend to everyone however are: The Czar, a Victorian raised camellia in rich scarlet with delightful golden stamens, the flowers are semi-double and very beautiful. Emperor variegata or Great Eastern, a very large, double red, with a white blotch and a magnificent flower in every way; Edward Billing (this is the New Zealand name which has been adopted here, elsewhere it has other names) a very full, informal pink and a very lovely camellia indeed. Purity, a white camellia so perfectly formed that it almost holds one spellbound. Red Waratah, a fine double red with a paeony-shaped centre; and Optimus, a really lovely pink variety, heavily striped with deeper rose.

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KAPOK BUSH

(Aerua tomentosa)

A Very Useful Perennial for North-West Pastoral Areas

By W. M. NUNN, Officer-in-Charge, North-West Branch, and
H. SUIJDENDORP, Agricultural Adviser

IN our drier North-West pastoral areas rains are normally confined to the summer months. Dependent upon cyclonic influences, they are very uncertain, and a region said to enjoy an average of 10in. rain per year, might have as little as 1in. or as much as 30in. in any one season. Whether the recordings are high or low they are nearly always confined to those few summer months, and a long dry period generally extends without break from May to December.

The latter part of this dry season is necessarily an unhappy time from the animal nutrition point of view.

Grasses have matured and dried off. A good deal of the leaf and seed has been eaten or blown away, and the crude protein content of remaining edible material is usually well below 5%. Spinifex remains intact and green somewhat longer, but an

Fig. 1.—Kapok bush spreading from a concentration under a derelict bedstead in an old native camp on Abydos Station

average stand at this time of the year would obtain no more than 6% of protein.

On many stations, ewes are expected to rear lambs under these conditions, and as a ewe needs a protein content of 16% for satisfactory milk production it is not in the least surprising that ewe and lamb mortality is high.

In the ruminant, bacterial activity within the rumen or first stomach, is an important factor in digestion. Recent investigations have shown that a minimum of 8% crude protein is necessary in the diet of the sheep to enable these organisms to do their work properly. Unless this percentage is available the animal does not obtain full benefit from the forage consumed.

Where the protein content is as low as 5% or 6% therefore, even a dry sheep suffers a degree of malnutrition though the dry feed available may be plentiful.

Into this grim picture comes a very useful plant commonly called Kapok bush or pillow bush. Tiny black seed are embedded in fluffy white balls which en masse resemble the kapok of commerce.

For many years these plants have been growing near homesteads and camp sites in the Port Hedland area, but their importance was not recognised until comparatively recently.

It is thought by many that the seed may have been introduced, along with Buffel grass, in saddle-packing or fodder for camels in the early days when camel teams played a part in our North-West transport system.

Others have suggested that the crews of pearling luggers may have brought the seed

in mattresss and pillows from the islands north of Australia. Either or both explanations seem feasible as the plant is indigenous to India and Afghanistan which supplied camel fodders, and also to Burma, Ceylon, Java, Sumatra and the many other islands north of Australia which would have been ports of call for pearling vessels.

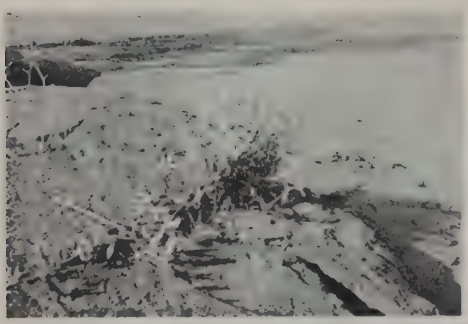

Fig. 2.—Kapok bush growing in a crack in a granite rock. This bush had recently been eaten down by cattle which left only one flowering stalk

Wherever it came from in the first instance, its use as a filling material for bedding has certainly aided its spread here in our country. It is frequently to be found where natives have had their encampments. The concentration under the old bedstead in the photograph certainly suggests that a native brought it to this particular site.

Station-owners and managers in the Port Hedland area now value the plant highly, and are actively assisting its spread. Already there are large acreages of it along the DeGrey, Coongan, Yule and Turner Rivers, and it seems adaptable to a wide variety of soils, from red sand dunes to comparatively heavy loams.

The plant is a perennial and develops a taproot which penetrates many feet into the soil. This may account for the fact that kapok bush stays green and continues to make growth long after grasses have dried off.

The young plants have abundant foliage, but it gets rather sparse when the plant matures and flowers. However this foliage

Fig. 3.—Kapok bush, buffel grass and spinifex make a good mixed diet on De Grey Station

is highly nutritious as its crude protein content is as high as 26%. In areas where the country carries good nutritious forage for a considerable portion of the year, the animals do not seem to favour it particularly until other vegetation has dried off. Even as late as October-November, the plant is still green, and analysis shows about 21% crude protein. Thus it admirably balances the diet during this lean period, and assists the animals to utilise the dry foliage more efficiently. Sheep seem to be in the habit of stripping leaves off the stalk and do not seem to touch the seed. Cattle often consume the entire plant.

Where the quality of forage is low all through the year, as in pure stands of spinifex, stock will eat kapok bush at any stage of growth, and it may be necessary to protect the plant when trying to establish them in these areas.

The seed is extremely hard and often difficult to germinate. A method which has given considerable success in spinifex country is to combine planting with the spinifex burn, so that heat from the fire is used as an aid to germination. Seed is scattered among the spinifex during winter months. Dust and sand provide cover for the seed, and the spinifex is burned shortly before the summer rains are due.

Burns of this nature are necessary of course to dispose of overgrown and useless spinifex. They are best delayed until just before summer rains so that the country is not left bare and exposed to wind erosion for long periods. Combined in this way with the spread of kapok seed it has been very successful, in a number of instances, in establishing a quick stand of kapok bush.

Kapok bush has recently shown up on a number of Kimberley stations where it has in all probability been introduced along with buffel seed from the Port Hedland area.

It has enjoyed a mixed reception in the Kimberleys so far, because its value has been unknown, and as cattle don't rush it in the early stages many have looked on it as a possibly undesirable weed.

Cattle may not take to it readily in good Kimberley seasons, when other attractive fodder plants are available, but we do know that cattle enjoy it in the spinifex areas, and there seems every reason to believe that it would greatly improve the grazing on Kimberley pindan soils if it can be established there.

Mr. G. C. Rose, at Mt. Anderson, has already taken active steps along these lines.

Using a Ferguson tractor he has run plough furrows through some of his country, and has broadcast kapok and buffel seed along the furrows.

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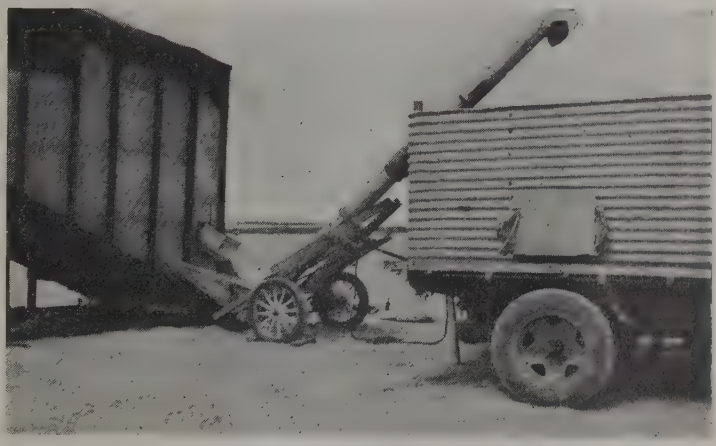


The P.T.O.-operated elevator, mounted on farm-built transport frame, is shown in position ready to transfer wheat from the field storage bin to the motor truck

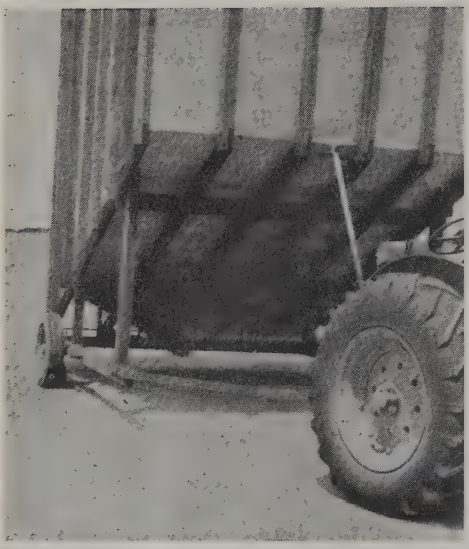
Even today, many farmers still use bags when taking wheat from the harvester box, and for carting it into the bulk bins at the siding. On an ever-increasing number of farms however, the jute sack is becoming as obsolete as the horse-works.

The photographs accompanying these notes were taken on the property of Miss M. York, of Wongans Hills where, from harvester to siding, the grain is handled entirely without the use of bags.

A trailer-mounted bin (not shown in the photographs) is attached to the harvester and holds about 70 bushels of grain when filled.

An elevator (Fig. 1) which is operated by the power take-off of either the truck or the tractor, is used for transferring wheat from the trailer bin. It can handle

The field storage bin showing transport wheels fitted for moving to a new position. The wheels are removed when the bin is in use

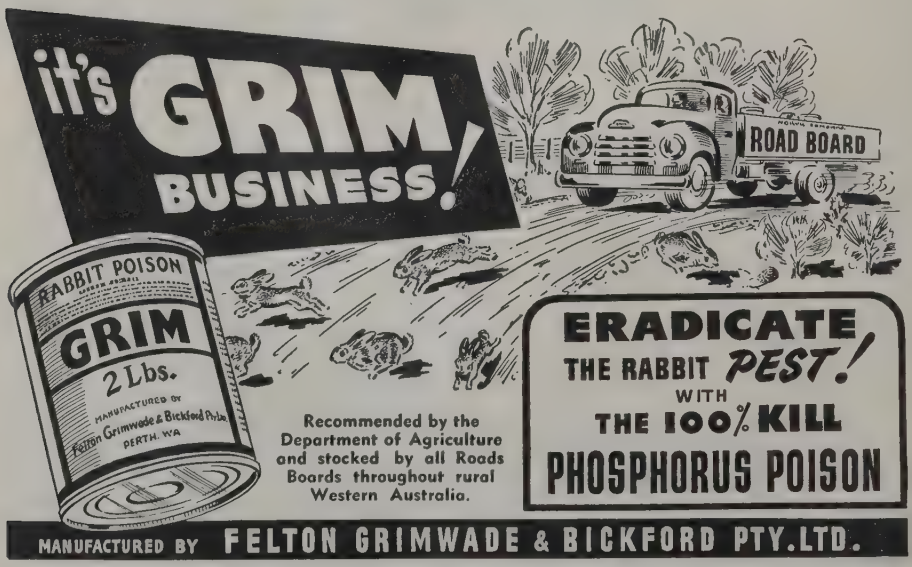


Close-up of field storage bin showing the inbuilt auger underneath the bin

up to a ton of wheat a minute and is easily transportable. With the elevator, grain may be transferred from the harvester trailer bin to the truck-mounted bin for transportation to the siding—or alternatively into the large field storage bin.

The field storage bin is made of timber, lined with flat galvanised iron and has a capacity of approximately 1,000 bushels. It is fitted with detachable wheels for transportation to selected sites when empty, and has a tarpaulin cover. When in position, the transport wheels are removed and the bin rests firmly on the under-frame.

Its sloping floor permits most of the wheat to run by gravitation through a side door into the elevator hopper. The last 100 bushels are driven out by an inbuilt auger shown beneath the bin in Fig. 3.



NUTRITION AND DISEASE

By J. CRAIG, M.R.C.V.S., Senior Veterinary Surgeon.

IN this article I hope to give readers some ideas concerning the less obvious effects of animal disease, especially in relation to nutritional defects. Disease has been defined as any departure from the normal, so that we are not dealing merely with those specific diseases which are caused by bacterial or virus infections.

The extent to which inadequate nutrition can cause losses of stock by death, or alternatively can pull down the production figures, is seldom fully realised.

In times of drought there are usually heavy stock losses and the production of such items as wool and meat falls dramatically. Drought means starvation—which is an acute form of malnutrition—and the cause is only too obvious.

WORM INFESTATION

Malnutrition in a less acute form is far more common than is generally realised—and because it is not particularly obvious it goes on for year after year causing losses which, in the aggregate, are more extensive than those caused by occasional droughts. Disease and malnutrition go hand in hand, and this is seen particularly in worm infestations of sheep and cattle. Animals that are well fed can carry a fairly heavy worm burden without any apparent ill effects, but those that are badly nourished and running on poor pastures often die, or lose condition to a marked extent.

The parasites to which am I referring are the "hair worms" which cause heavy losses in cattle herds. Calves are most susceptible to worm infestation, while young cattle up to the age of 18 months may also suffer severely. Most infestations occur following autumn rains and the symptoms are usually seen during the late autumn, winter and early spring. Evidence of infestation may be seen at any time of the year however, especially when a falling off in the plane of nutrition has taken place.

In the prevention and control of hair worms in cattle, treatment by means of worm drenches plays only a minor part in the attack on the parasites. This is easily understood since the worm drenches we have at our disposal—2 per cent. bluestone-nicotine, sulphate, and phenothiazine—are not nearly as effective against worms in cattle as they are against worms in sheep.

Because of this it is all the more important to keep young stock on well-drained pastures, practise rotational grazing, avoid overstocking and, most important of all, maintain a good nutritional level. By this, I mean, that at weaning, calves should have a good supplementary ration, the best supplements consisting of whole or crushed cereal grains, oats probably being the most popular, while wheaten bran adds to the palatability of a ration and is much used for this purpose. A suitable lick such as salt and bonemeal, and/or copper and cobalt in the areas where these are deficient should be placed out separately.

Calves should be taught to eat grain as soon as possible and by the third week should be tried with a handful of grain placed in the bottom of the bucket after each animal has drunk its milk. At six weeks ½ lb.; at two months 1 lb. and at three months 2 lb. of grain daily should be quite sufficient until the calf is six months old. It must be remembered, that well-cured, good quality meadow hay, and good pastures, are necessary components in the ration, and should always be available for young growing stock.

LICE ON CATTLE

Before leaving the topic of parasitic infestation, I wonder how many of you have noticed the effects of lice infestation in cattle. In W.A. the long-nosed sucking louse is frequently found in dense clusters

in young stock. These lice feed by piercing the skin and sucking blood, and infestation as a rule varies with the bodily condition of the animal.

Generally speaking, lowered condition, poor feed, internal parasites, cold weather and lack of adequate excercise lead to very heavy infestations. The lice themselves are taken to be the main culprits, but in actual fact, malnutrition and faulty animal husbandry are really the primary factors. Nowadays of course, arsenical solutions for treatment are out; D.D.T. and gammexane (at double the strength recommended for use in a sheep dip) are more effective and more economical, and can be sprayed on the animal, the treatment being repeated in 14 days to catch the lice which have hatched from eggs in the meantime.

CALF SCOURS

Scours, one of the commonest troubles in calves is a complaint that is well known to dairy farmers. The term is an all-embracing one and may cover a multitude of different disease conditions.

Gross faults in feeding, internal parasites, coccidiosis, some infectious diseases, some poisons such as arsenic and cape tulip, and probably Vitamin A deficiency may all produce scours. But the cause of what we frequently term true "calf scours," despite a good deal of research, has not yet been definitely established. It may occur within a few hours of birth, or possibly within a few days, and the germ involved usually turns out to be *Bacterium coli.*

This disease is undoubtedly associated with errors in calf husbandry, and exposure to cold and damp, over-feeding (with rapid curd formation in the fourth stomach), and sudden changes of diet seem to be the predisposing factors. The new-born calf should have colostrum (also known as "first milk" or "beastings") as soon as possible after birth, since colostrum has laxative properties, and contains protective substances which assist the calf in resisting disease during its early life.

Feeding should be regular and *not* at frequent intervals. The milk should be fed at blood heat. The change to separated milk should be gradual and at this time 1 oz. cod liver oil daily is useful. In addition, it must be remembered that scrupulous cleaning and sterilisation of utensils, and the provision of a good dry bed are essential to the well being of the calf.

I have not mentioned specific treatment for calf scours, but sulphamezathine and sulphaguanidine are both useful. Milder cases may respond merely to boiled water and glucose or to 2 oz. castor oil followed by lime-water and milk.

It has been reported in America that regulated nipple feeding may be an aid in the control of scours, and recent work in N.S.W. has tended to confirm that idea. In one experiment, a pair of identical twins were put on nipple feeding, one with a regulating jet so that the calf was compelled to suck for 20 minutes to get its allowance of milk. The other was fed *without* a regulating jet, so that it was able to drink the same amount in three minutes. Within 24 hours this calf developed scours.

After the scouring had cleared up, the experiment was reversed and the other calf then developed scours. Further experiments with other twins have produced the same results.

MINERAL DEFICIENCIES

All animal foodstuffs or fodders contain minerals, but when the mineral content of fodders is low, or when exceptional circumstances force a demand for minerals that is greater than can be supplied through the normal food intake, mineral supplements are necessary; and this is particularly applicable with high-producing cows.

Mineral supplements are usually provided in the form of licks containing calcium and phosphorus, either as bonemeal, bone flour or di-calci phosphate; molasses, which has a relatively high content of both calcium or magnesium, is also used as an adjunct to the usual mineral lick.

Most of the minerals essential for health are stored within the animal body and can be used as required, being carried to the organs and tissues by the blood serum —the clear straw-coloured fluid portion of the blood. In normal health, the concentrations of the various minerals in the blood serum remain fixed and constant,

within certain defined limits. Variations in these concentrations however, brought about by abnormal conditions, may give rise to sickness and even death.

Three conditions commonly occurring early in the lactation period are those known as milk fever, grass tetany and acetonaemia, and are especially common in the winter and spring months when green feed is abundant.

Milk fever is associated with a lowering of the calcium and phosphorus content of the blood; in grass tetany the magnesium and calcium blood levels may be lowered; while in acetonaemia there occurs a fall in the level of the blood sugar, together with the appearance in the blood serum of toxic substances known as ketones or acetones, which give the disease its name.

The actual cause of these conditions has not yet been fully worked out, but there is little doubt they are in part at least of nutritional origin, and recent research has shown them to be due to a temporary failure of the elaborate bodily mechanisms which involve the parathyroid glands, the pituitary (or so called master gland) and the adrenal cortex (which is part of the adrenal glands that lie near the kidneys). These are endocrine (or internal secreting) glands and the hormones which they secrete help to keep the animal body running in a normal manner. Thus with a better understanding of these metabolic diseases, new treatments have come into being, notably with regard to acetonaemia, where it has been shown that injections of cortisone coupled with glucose have proved remarkably successful. Unfortunately, this drug is not yet on the free list as it is for human patients, and the cost at present may deter all but the owner of a valuable pedigree animal.

As you know, "milk fever" can recur in spite of a superabundance of calcium and phosphorus in the food, and can be treated without a change of diet, by an injection of calcium alone—a trivial quantity when compared with that already stored up in the bony skeleton of the cow. In this regard, an intersting development has recently come from America. In the dairy herd in which milk fever was very prevalent, half the cows were given a mineral supplement rich in phosphorus during the six weeks prior to calving, while the rest of the cows were left as controls. The idea behind this unusual approach to the problem (i.e. competition of excess phosphorus with calcium) was to try to stimulate the parathyroid glands which control the level of calcium in the blood—and thus to raise the calcium blood levels and reduce the incidence of milk fever at calving time. In the small trial carried out, successful results were achieved, so we have perhaps some new food for thought in our approach to this disease.

Among susceptible herds and notably for pregnant and parturient cattle the use of supplementary feeds rich in calcium, phosphorus and magnesium may be indicated, although the degree of utilisation of these minerals is an unknown factor unless actually checked by laboratory methods.

Grass tetany and "bloat" or tympany of the rumen or paunch, may be controlled in part at least by a good animal husbandry approach.

With this in mind, the feeding of a balanced ration, including roughage sufficient to ensure correct bowel functioning, is essential especially where milking cows are being grazed on, or are first turned out on soft, lush or young pastures.

Vitamin deficiencies with all their different manifestations are examples of true nutritional disease, as of course are the ill effects produced when such minerals as calcium, phosphorus and the trace elements copper and cobalt are deficient in the diet.

A true calcium deficiency is very rare in pastured animals, but phosphorus deficiency is common in severe forms in many phosphorus deficient areas in the world, notably South Africa. While no longer of common recurrence in W.A. it may be seen particularly in long-settled areas, where for many years minerals have been taken from the soil and not replaced by top dressing. It may occur where rabbits have destroyed valuable pasture species such as clovers and other legumes. Typical symptoms include a failure to thrive, poor development and sometimes a temporary sterility, while another obvious features is a craze for bones (known as osteophagia). This mineral hunger is important in that such

bones are commonly contaminated by the micro-organism Clostridium botulinum, and the toxin or poison formed by this germ results in botulism or "toxic paralysis," a more often than not fatal disease of cattle, which, however can fortunately be prevented by vaccination. The top dressing of soils with superphosphate, and the provision of ground rock phosphate during the summer months are clearly indicated in such instances.

Large tracts of W.A. are known to be copper-deficient and cattle appear to be most severely affected in that proportion of the jarrah-redgum belt extending from just north of Busselton to several miles south of Margaret River, and within 15 miles of the coast. The Northcliffe district is similarly affected, as are also the Gingin and Dandaragan districts to the north. Other areas, notably the semi-coastal country in the region of Perth and Bunbury, are suspected, but have not been investigated completely.

Signs of deficiency are most marked between August and October, and more evident in good seasons with abundance of green feed, than in drier years. Young stock are particularly affected, showing unthriftiness, retarded growth, joint abnormalities and diarrhoea. Adult stock show depraved appetite, eating the soil around the roots and butts of upturned trees, and may scour freely, while in severely deficient areas "falling disease" may be encountered. In this acute form of the disease, death occurs close to calving or just after, and an apparently normal cow, may suddenly bellow, throw up its head and fall dead, when being turned out to pasture after milking.

Copper supplements in the form of Denmark lick are in common use throughout the affected areas, but topdressing of the pastures generally at the rate of 5 to 10 lb. of copper sulphate per acre mixed with superphosphate is also useful, and the benefit persists for a number of years.

Cobalt deficiency, which is also known as "wasting disease," was at one time believed to affect only young cattle, and to be confined to some of the karri slopes in the Denmark district and also to the Nornalup and Walpole districts, but it is probably present in other parts of the South-West.

Young cattle between 6-18 months are more susceptible than adult stock, and there is a progressive loss of condition, anaemia and scouring. In adult cattle, there is depressed milk secretion, abortion and sterility. Finally, with progressive weakness, death occurs from three months to two years from the onset of the first symptoms.

The disease may occur at any time of the year but is most common during the spring and early summer when green feed is abundant.

Extremely small quantities of cobalt (5-10 mill. grams. of cobalt chloride) will cure and prevent Wasting Disease in cattle. Denmark Lick No. 1 incorporates cobalt in the necessary quantities, while it is also possible to treat hay with cobalt solution and thus eliminate the necessity of hand feeding dry cattle.

Finally I would like to close with a brief word on rye grass staggers, a disease which has not yet been recorded in this State, but which may make its appearance here some day.

Recent outbreaks of rye grass staggers in cattle have been reported from Southern Victoria, these outbreaks following light rains which brought on new growth in paddocks in which rye grass was predominant.

Calves are much more commonly affected than adult cattle and symptoms include an inability to move rapidly, a tendency to fall, staring eyes and laboured breathing. When the animals are not disturbed, symptoms may not be noticeable and grazing takes place quite naturally. Often, affected calves have great difficulty in regaining their feet after falling over.

Rye grass staggers in cattle is rarely fatal, but deaths may occur as a result of an accident such as an affected animal falling into a water hole or creek.

To control outbreaks, stock should be moved to a paddock containing little or no rye grass. Recovery will then take place within a few days. Alternatively, the animals can be confined on a relatively small paddock and hand-fed with oaten or lucerne hay until the rye grass matures. The animals can then be returned to it quite safely.

VETCH SPECIES TRIAL

WOKALUP RESEARCH STATION, 1952

By F. E. RYAN, B.Sc. (Agric.), Agrostologist.

VETCHES are again receiving attention as a suitable crop for the heavy rainfall districts, and experiments at the Research Station, Wokalup, and demonstrations throughout the dairying areas have shown that they can be grown successfully. Vetches have special merit when grown with oats as a rotation crop on areas which have been under subterranean clover for a number of years and which may or may not show signs of deterioration.

The use of a mixed crop in this way would be a modification of the ley system which has helped to raise the productivity of large areas in England. The cultivation of the soil for this crop will leave it in a suitable condition for early seed bed preparation in the year following the crop, and this provides an opportunity for the introduction of improved strains of pasture plants into existing pastures.

The use of vetches in the hay or silage crop provides a fodder with a much higher protein content than is obtained from oats alone.

Commercial Purple Vetch is recommended for the higher rainfall areas and should be sown at the rate of 15 lb. to the acre of vetch with 60 lb. to the acre of Algerian oats.

A number of strains of vetches have been under test at the Research Station at Wokalup and the following report sets out the results which have been obtained.

1952 VETCH SPECIES TRIAL

Varieties.

Varieties included in this trial during 1952 were:—

Vicia articulata C.P.I. 9186

Vicia atropurpurea (Commercial Purple vetch).

Vicia atropurpurea (C.P.I. 10117 Purple vetch).

Vicia atropurpurea (C.P.I. 10374 Purple vetch).

Vicia dasycarpa C.P.I. 9189 (Woolly Pod vetch).

Vicia sativa (Commercial Golden Tare).

Vicia sativa (P4059) (Malta Vetch).

Rainfall.

Rainfall date for Harvey, about 5 miles from Wokalup Research Station is given below. Harvey is the nearest recording point with an average over a sufficiently long period.

RAINFALL IN POINTS.

	Apr.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total Apr. to Dec.
Harvey (1952)	10	634	1,212	432	530	432	381	116	60	3,807
Harvey average for 46 years	182	562	804	795	612	443	287	102	55	3,842

The last substantial fall of rain before the latest plots were harvested for forage yields on December 8, was 61 points on November 5.

Site.

On Bundinup loam, the original vegetation being mainly marri (Eucalpytus calophylla). The area has been cleared for many years. Just prior to the experiment, it had been under poor pasture consisting mainly of inferior annual grasses.

Preparation.

The area was ploughed on June 6 and between then and planting in early July was thoroughly cultivated and harrowed to get rid of weeds. A good seed-bed was formed.

Rates of Seeding.

All vetches were sown at 30 lb. to the acre with 30 lb. to the acre of Algerian oats.

The vetch seed was inoculated with pea culture and sown broadcast mixed with the oats on July 2.

Fertiliser.

Two cwt. to the acre of super was broadcast at the time of seeding. A covering harrowing was then made.

General Growth.

Germination was good and even of both vetches and oats. Vetches grew well from commencement of the season and no insect damage was observed; all plots producing a good stand. Oats were grazed by rabbits in the early stages before these were eliminated and the vetches tended to dominate on all plots, particularly Purple vetch strains and Woolly Pod vetch.

Purple vetches appeared most vigorous in growth during the season, closely followed in this respect by *Vicia dasycarpa*. Malta vetch was of good growth habit, but usually not so productive as Purple vetch and *Vicia dasycarpa*. Golden Tare and *Vicia articulata* were least attractive of varieties grown.

Vicia articulata, Vicia atropurpurea (all strains) and *Vicia dasycarpa* were fine-stemmed, leafy types, whereas Malta and Golden Tare were not quite so attractive.

Lodging occurred to a greater or less extent on most plots, but was worst on *Vicia articulata* and Golden Tare plots.

Maturity.

Flowering and maturity times are given in the following table:—

Species.	Varieties.	Flowering Date.	Green Forage Cutting.
Vicia sativa	Malta vetch	8–10–52	11–11–52
„ *articularta*	....	12–10–52	11–11–52
„ *dasycarpa*	C.P.I. 9189	27–10–52	8–12–52
„ *sativa*	Golden Tares Comm.	6–11–52	5–12–52
„ *atropurpurea*	C.P.I. 10117	6–11–52	5–12–52
„ „	Comm. Purple	11–11–52	5–12–52
„ „	C.P.I. 10374	11–11–52	8–12–52

The varieties may be divided into two maturity groups—an early group with *Vicia articulata* and *Vicia sativa* (Malta vetch) and a late group, comprising all other varieties.

Yields.

Forage yields were taken for each variety when the majority of the pods had begun to swell with seed. Yields are given in the following table:—

Species.	Variety.	Yields of Vetches and Oats.			
		Green weight.		Air dry weight.	
		Cwts/ac.	Per cent. of V. articulata.	Cwts/ac.	Per cent. of V. articulata.
Vicia atropurpurea	Comm. Purple	208	118	64	178
„ „	C.P.I. 10374	174	98	55	152
„ „	C.P.I. 10117	193	109	54	150
„ *dasycarpa*	C.P.I. 9189	202	114	52	144
„ *sativa*	Golden Tare	191	108	49	136
„ „	Malta	213	121	45	125
„ *articulata*	....	177	100	36	100
General Mean	....	194	110	51	142
S.E. as per cent. of G.M.	....	9·7%	....	9·5%	
L.S.D. 5 per cent.	....	N.S.	....	17·6	

Highest yields were obtained from purple vetches and none of the varieties was higher in yield than commercial purple vetch.

A composite sample from each variety was analysed chemically and the results are given in the attached table.

DISCUSSION

During 1952, the rainfall in the late spring was reasonably good with the result that late varieties, such as Purple vetch, were very successful.

The vetches in this trial can be grouped according to maturity into an early group consisting of *Vicia articulata* and *Vicia sativa* (Malta vetch) and a late group comprising all other varieties. It is considered that under normal seasonal conditions the late group would still reach a suitable hay stage at Wokalup Research Station, but in drier areas, species such as *Vicia articulata* or Malta vetch would be more suited. There was no significant difference in the yield of green material from any of the varieties.

Air dry weights varied from 36 to 64 cwt. per acre. Commercial Purple vetch gave highest yields and was significantly higher in yield than *Vicia articulata* and Malta vetch. The two introduced strains of Purple vetch C.P.I. 10374 and 10117 were also significantly better than *Vicia articulata* but were not better than Commercial Purple vetch in yield.

From these yield results, the most promising variety for Wokalup conditions appears to be Purple vetch (*Vicia atropurpurea)* and none of the introduced strains was found to be more productive than the commercial seed.

Composite samples from each treatment were submitted for chemical analyses. The crude protein content on a dry matter basis ranged from 14.7 to 19.5 per cent. protein and it is clear that these crops provide a very valuable source of protein for animals during summer when the protein content of the pastures is low.

The protein content of the hay compares very favourably with bran and pollard which are already in use for summer feed for dairy cattle.

Yields of 64 cwt. per acre of dry material suggests conservation of fodder of this nature could be used to replace a considerable proportion of the bran and pollard already supplied to dairy cattle.

The following comments can be made concerning the species grown.

Vicia atropurpurea—Commercial Purple Vetch.

This variety gave highest air-dry forage yields. It is late maturing, but in the hilly country at Wokalup the season is sufficiently lengthy for it to reach a suitable hay cutting stage satisfactorily. It is later in maturity than the Algerian oats grown in association and reached a hay stage of maturity when the oats were too far advanced for hay.

All strains of Purple vetch were vigorous throughout the growing period, even in the early seedling stages. The habit of growth was fairly thin stemmed and leafy, this being a favourable characteristic for hay making. Weather conditions for hay making should be ideal when this type is ready for cutting.

Vicia atropurpurea—Purple Vetch C.P.I. 10374.

Maturity for hay cutting is slightly later for this variety than Commercial, but in other characteristics it appears similar.

It does not appear to have any particular advantages over Commercial variety.

Vicia atropurpurea—Purple Vetch C.P.I. 10117.

This strain was also similar to Commercial Purple and C.P.I. 10374, except that the flowering date was five days earlier. Maturity for hay, however, was the same as the Commercial. This variety does not appear to have any advantage over Commercial Purple vetch.

Vicia dasycarpa—Woolly Pod Vetch C.P.I. 9189.

Air-dry forage yields of this variety were numerically but not significantly less than Commercial Purple vetch. Flowering date was 15 days earlier than Commercial Purple vetch, but maturity for hay was slightly later.

In appearance *Vicia dasycarpa* was always nearly as good as Purple vetch in vigour of growth. Plants were uniform and fine stemmed. The early flowering date may be of importance in some seasons and for this reason, this variety is worthy of further trial. It is later than Algerian oats in reaching a suitable hay stage.

Vicia sativa — Common Vetch — Golden Tare.

Yields of air-dry forage were numerically, but not significantly less than Commercial Purple. The date of flowering was nearly five days earlier than Commercial Purple, and maturity for hay was at the same time. General appearance was not especially promising. Its habit of growth was rather straggly and thick stemmed.

Vicia sativa—Malta Vetch P4059.

Air-dry forage yields of this variety were significantly lower than Commercial Purple vetches and numerically but not significantly lower than other strains of Purple vetch, *V. dasycarpa* and Golden Tare.

This variety was distinctly earlier than all others except *Vicia articulata*. It gave fairly vigorous growth, but was rather thick stemmed. By the end of October it was very erect for a vetch, but the pods became swollen early in November and thereafter it lodged rather badly.

The chemical analysis indicated that this vetch gave highest protein yield of all varieties. It appears worthy of further trial in comparison with *Vicia articulata* as an early variety or for sowing in the spring months.

Vicia articulata.

The air-dry and forage yields of this strain were significantly lower than those of Purple vetch and numerically but not significantly less than other species. This variety was early in flowering and maturity and compared with Malta vetch. In general appearance it was fairly good; the plants being leafy and thin stemmed. In this trial it tended to lodge rather badly.

Vicia articulata is tolerant to attack by red mite and lucerne flea and has an ability to hold its seed exceptionally well without shattering. Because of its earliness, *Vicia articulata* may be preferable to late varieties for areas where the season is short. Because of its fine stemmed leafy nature and tolerance to insects it may be more useful than Malta vetch in some early districts. Tendencies to lodge can be overcome by a lighter vetch and a heavier oat rate of seeding.

CONCLUSION

Commercial Purple vetch *(Vicia atropurpurea)* gave the best yield of air-dry matter and was suitable as a hay variety at Wokalup even though late in maturity.

Vicia articulata is early in maturity and suitable as a hay variety for areas with a shorter growing season. *Vicia articulata* and Malta vetch *(Vicia sativa)* merit further trial.

All the vetches gave a high yield of hay, which on analysis, was found to be very nutritious and could be used to replace portion of the concentrate fodder purchased by dairy farmers.

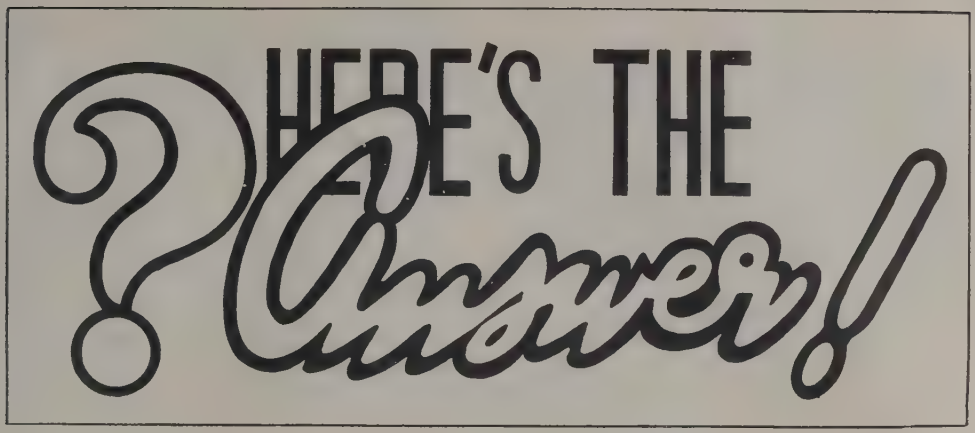
ACKNOWLEDGMENT

Acknowledgment is made of the assistance received from other officers of the Dairy Branch in carrying out the work and preparing this article for publication.

WOKALUP RESEARCH STATION
VETCH SPECIES EXPERIMENT, 1952
CHEMICAL ANALYSES OF MIXED VETCH AND OAT HAYSTAGE FORAGE SAMPLES

All figures are derived from composite samples for each strain.

Species and Strain.	Date Cut.	Chemical Analyses, Percentage on Dry Matter Basis.				
		Crude Protein.	Crude Fat.	Crude Fibre.	N Free Extract.	Ash.
Vicia articulata, C.P.I. 9186–7	11–11–52	15·2	1·1	30·8	45·3	7·69
V. atropurpurea, Purple vetch—commercial	5–12–52	15·0	1·3	30·6	46·2	6·95
V. atropurpurea, C.P.I. 10117	5–12–52	17·4	1·4	27·5	46·6	7·12
V. atropurpurea, C.P.I. 10374	8–12–52	15·8	1·2	31·6	43·8	7·55
V. dasycarpa, C.P.I. 9189	8–12–52	14·8	1·1	30·9	45·3	7·87
V. sativa—commercial—Golden Tares	5–12–52	14·7	1·1	30·1	45·5	8·63
V. sativa—Malta vetch	11–11–52	19·5	·9	28·0	43·3	8·26



PIG WITH MANGE

I have a sow with some kind of itch which is causing severe irritation. The skin on her head and the lower part of her body and legs gets wrinkled and scaly and she is constantly rubbing herself and has rubbed away most of the hair.

The symptoms suggest that the animal is suffering from Mange, and leaflet No. 813, "Sarcoptic Mange of Pigs", which has been forwarded to you will give more detailed information on the matter.

This condition may be treated by thoroughly spraying the animal over all the skin surface with a lime-sulphur solution prepared by diluting one part of commercial concentrated lime-sulphur with 12 parts of water.

BLACK SCOUR WORM

Could you let me know what chemicals may be used in dams to destroy any parasites dangerous to the sheep drinking such water. I have an idea that my young sheep are getting Black Scour from their drinking water which is contained in an old dam. Also, what quantity of bluestone should be added to salt to make a suitable sheep lick.

No purpose would be served by the treatment of dam water for the control of Black Scour Worms in sheep. The larvae of the Black Scour Worm do not live in water but are present on the soil and pasture. During moist or rainy weather they crawl up the blades of grass and are swallowed by the sheep while grazing.

In the mixing of a sheep lick to correct copper deficiency, bluestone should be used at the rate of 10 oz. to 1 cwt. of salt. It is best to first dissolve the bluestone in half a gallon of water and gradually add this solution to the salt, mixing continuously until the colour is uniform. Leaflet No. 679 deals with worms in sheep and is available free of charge from the Department of Agriculture.

COW WITH NASAL TROUBLE

One of my cows has been troubled for some time with an irritation in her nose. She has been snorting, blowing and rubbing it and at times there are traces of blood.

The symptoms you have described are those of nasal granuloma. In addition to intense irritation there are usually symptoms of nasal discharge which may be tinged with blood, and an inspection of the nasal passage reveals it to be inflamed and ulcerated, and sometimes studded with nodules.

There does not appear to be any satisfactory curative treatment for this condition and it is suggested that you should fatten the animal and dispose of it to the butcher.

COW POX

The udder and teats of a five-year-old cow frequently break out in an eruption. This appears as a number of sores exuding a watery substance and these dry into hard scabs which fall off but others appear in a short time. The presence of the sores make milking very difficult. Is the trouble contagious and likely to be communicated to human beings?

The eruption on the udder appears to be a disease known as "cow pox". This disease may be communicated to human beings, but in actual fact it seldom seems to affect milkers' hands in this country, especially if ordinary precautions are taken such as washing the hands before and after milking.

The condition may be treated by the application of a lotion prepared by dissolving one ounce of zinc sulphate in one pint of water. The lotion should be applied to the affected parts night and morning after milking. An application of 4 per cent. salicylic ointment should be found equally satisfactory.

Do Not Relax Foot-Rot Control Measures

ALTHOUGH the incidence of foot-rot has been slowly reduced, the disease is still very prevalent in the areas of higher rainfall, and it is important that there should be no relaxation of the measures which have been adopted for it control and eventual eradication.

The disease is usually at its worst during the spring, when wet conditions underfoot and a heavy growth of clover and other herbage favour the spread of infection. Under these conditions a large proportion of the flock, including both adult sheep and lambs, may become affected.

When the feed dries off in summer the disease subsides, and although carriers of infection are still present there may be little or no evidence of foot-rot in the flock. These carriers perpetuate the disease, and, with the onset of winter, active cases commence to appear and to increase in numbers until the infection reaches its peak in the spring. Foot-rot results from infection with the microbe *Fusiformis nodosus*, which is always present in the feet of affected sheep, where it may persist for several years.

The infection is, however, unable to survive in the soil for more than 7-14 days, and it is consequently possible by disposing of the whole of an infected flock for slaughter, and restocking after a fortnight with "clean" sheep from a dry inland area, to completely eradicate foot-rot from a property. This method has been successfully employed by a considerable number of farmers in the higher rainfall areas. In a somewhat similar manner the disease may be eradicated by the removal of "carriers" while the disease is quiescent in summer.

The eradication campaign should commence in the winter when the feet should be kept pared and the flock regularly passed through a foot-bath and transferred to spelled paddocks. Any sheep showing evidence of the disease should be isolated in a convenient paddock where the feed is short, and treated in a foot-bath containing bluestone or formalin until recovery is complete and they may be safely returned to the main flock.

It is necessary to emphasise that unless paring is drastic enough to expose all pockets of infection, success in treatment will not be achieved.

By adopting these measures throughout winter and spring it will be possible to keep the disease under control; fewer cases will occur, and this will enhance the prospects of successfull eradication when the removal of the "carriers" is undertaken during the summer months.

The detection of these carriers will involve the examination of every foot of every sheep on the property followed by the removal and segregation of every animal showing evidence of infection, or the presence of hidden pockets of infection. The feet of these sheep should be carefully pared, and they should be treated in a foot-bath until freed of infection. Alternatively they may be disposed of for slaughter, or if the number are not too great, retained on the property in isolation and used for ration purposes.

In the areas where it exists, foot-rot represents a greater source of loss to the sheep and wool industry than all other sheep diseases. It may definitely be eradicated by one or other of the methods described, and this should be the objective of all sheepmen whose flocks are known to be affected.

Further information is contained in Leaflets Nos. 2099 and 2126, which may be obtained upon application to this Department.

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15 TPC.

SUNRISE AND SUNSET TIMES FOR JAN.-FEB., 1955

(Supplied by the Government Astronomer)

Times of sunrise and sunset for every fifth day, are given for a number of towns throughout the State. Times for a town not on the list may be estimated if its position in relation to one or more of the listed towns is known. The times given for sunrise are those of the first appearance of the top edge of the sun over a true horizon; those for sunset give the time of the sun's disappearance below a true horizon. Situation in a valley would make the sun appear to rise later, and on a hill it would appear earlier.

SUNRISE

Month.	Day of Month	Broome.	Port Hedland.	Onslow.	Carnarvon.	Yalgoo.	Geraldton.	Moora.	Kalgoorlie.	Southern Cross.	Merredin.	Perth.	Tammin.	Northam.	Narrogin.	Collie.	Bunbury.	Katanning.	Bridgetown.	Hopetoun.	Esperance.	Cape Leeuwin.	Albany.
Jan.	1	5·19	5·30	5·40	5·38	5·19	5·26	5·15	4·53	5·2	5·6	5·14	5·7	5·10	5·5	5·10	5·12	5·2	5·7	4·52	4·45	5·12	4·57
,, ...	5	5·22	5·33	5·43	5·41	5·22	5·29	5·19	5·57	5·6	5·10	5·17	5·10	5·13	5·9	5·14	5·16	5·5	5·10	4·55	4·48	5·15	5·1
,, ...	10	5·24	5·35	5·45	5·44	5·26	5·33	5·22	5·0	5·9	5·13	5·21	5·14	5·17	5·12	5·17	5·19	5·10	5·15	5·0	4·53	5·20	5·4
,, ...	15	5·26	5·38	5·48	5·47	5·29	5·36	5·26	5·4	5·13	5·17	5·25	5·18	5·21	5·16	5·21	5·23	5·13	5·18	5·3	4·56	5·23	5·10
,, ...	20	5·31	5·43	5·53	5·52	5·35	5·42	5·32	5·10	5·19	5·23	5·31	5·24	5·27	5·22	5·27	5·29	5·19	5·24	5·9	5·2	5·29	5·15
,, ...	25	5·33	5·45	5·56	5·55	5·38	5·46	5·36	5·14	5·23	5·27	5·35	5·28	5·31	5·26	5·31	5·33	5·23	5·28	5·13	5·6	5·33	5·19
,, ...	31	5·37	5·49	6·0	6·0	5·43	5·51	5·41	5·19	5·28	5·32	5·40	5·33	5·36	5·32	5·37	5·39	5·29	5·34	5·19	5·12	5·39	5·25
Feb.	1	5·38	5·50	6·1	6·1	5·44	5·52	5·42	5·20	5·29	5·33	5·41	5·34	5·37	5·34	5·39	5·41	5·31	5·36	5·21	5·14	5·41	5·27
,, ...	5	5·40	5·53	6·3	6·4	5·47	5·55	5·45	5·23	5·32	5·36	5·45	5·38	5·41	5·38	5·43	5·45	5·35	5·40	5·25	5·18	5·45	5·31
,, ...	10	5·42	5·55	6·6	6·8	5·52	5·57	5·50	5·28	5·37	5·41	5·50	5·43	5·46	5·42	5·47	5·49	5·40	5·45	5·30	5·23	5·50	5·36
,, ...	15	5·45	5·58	6·10	6·11	5·55	6·3	5·55	5·33	5·42	5·46	5·54	5·47	5·50	5·47	5·52	5·54	5·44	5·49	5·34	5·27	5·54	5·41
,, ...	20	5·47	6·0	6·12	6·14	5·59	6·7	5·59	5·37	5·46	5·50	5·59	5·52	5·55	5·51	5·58	5·58	5·49	5·54	5·39	5·32	5·59	5·46
,, ...	25	5·48	6·2	6·14	6·17	6·2	6·10	6·2	5·40	5·49	5·53	6·2	5·55	5·58	5·55	6·0	6·2	5·53	5·58	5·43	5·36	6·3	5·50
,, ...	28	5·49	6·3	6·16	6·19	6·4	6·13	6·5	5·43	5·52	5·56	6·5	5·58	6·1	5·58	6·3	6·5	5·56	6·1	5·46	5·39	6·6	5·53

SUNSET

Month.	Day of Month	Broome.	Port Hedland.	Onslow.	Carnarvon.	Yalgoo.	Geraldton.	Moora.	Kalgoorlie.	Southern Cross.	Merredin.	Perth.	Tammin.	Northam.	Narrogin.	Collie.	Bunbury.	Katanning.	Bridgetown.	Hopetoun.	Esperance.	Cape Leeuwin.	Albany.
Jan.	1	6·30	6·49	7·7	7·19	7·14	7·25	7·24	7·2	7·11	7·15	7·27	7·20	7·23	7·24	7·29	7·31	7·25	7·30	7·15	7·8	7·35	7·26
,, ...	5	6·30	6·50	7·8	7·20	7·15	7·26	7·24	7·2	7·11	7·15	7·27	7·21	7·24	7·24	7·29	7·31	7·26	7·31	7·16	7·9	7·36	7·26
,, ...	10	6·32	6·51	7·9	7·20	7·15	7·26	7·24	7·2	7·11	7·15	7·28	7·21	7·24	7·24	7·29	7·31	7·26	7·31	7·16	7·9	7·36	7·26
,, ...	15	6·33	6·51	7·9	7·20	7·14	7·25	7·24	7·2	7·11	7·15	7·27	7·20	7·23	7·23	7·28	7·30	7·24	7·29	7·14	7·7	7·34	7·25
,, ...	20	6·34	6·52	7·10	7·20	7·13	7·24	7·22	7·0	7·9	7·13	7·25	7·18	7·21	7·22	7·27	7·29	7·23	7·28	7·13	7·6	7·33	7·23
,, ...	25	6·33	6·51	7·8	7·18	7·12	7·22	7·20	6·58	7·7	7·11	7·23	7·16	7·19	7·20	7·25	7·27	7·21	7·26	7·11	7·4	7·31	7·21
,, ...	31	6·31	6·49	7·6	7·16	7·9	7·19	7·17	6·55	7·4	7·8	7·20	7·13	7·16	7·15	7·20	7·22	7·16	7·21	7·6	6·59	7·26	7·16
Feb.	1	6·31	6·49	7·6	7·16	7·9	7·19	7·17	6·55	7·4	7·8	7·20	7·13	7·16	7·15	7·20	7·22	7·16	7·21	7·6	6·59	7·26	7·16
,, ...	5	6·30	6·48	7·5	7·14	7·7	7·17	7·16	6·53	7·2	7·6	7·17	7·10	7·13	7·13	7·18	7·20	7·13	7·18	7·3	6·56	7·23	7·13
,, ...	10	6·29	6·46	7·3	7·11	7·3	7·14	7·11	6·49	6·58	7·2	7·13	7·6	7·9	7·9	7·14	7·16	7·9	7·14	6·59	6·52	7·19	7·9
,, ...	15	6·26	6·43	6·59	7·8	7·0	7·10	7·6	6·44	6·53	6·57	7·9	7·2	7·5	7·4	7·9	7·11	7·5	7·10	6·55	6·48	7·15	7·4
,, ...	20	6·23	6·40	6·56	7·4	6·55	7·5	7·1	6·39	6·48	6·52	7·3	6·56	6·59	6·59	7·4	7·6	6·59	7·4	6·49	6·42	7·9	6·58
,, ...	25	6·19	6·36	6·52	6·59	6·49	6·59	6·55	6·33	6·42	6·46	6·57	6·50	6·53	6·52	6·57	6·59	6·52	6·57	6·42	6·35	7·2	6·51
,, ...	28	6·18	6·34	6·49	6·56	6·47	6·56	6·52	6·30	6·39	6·43	6·54	6·47	6·50	6·49	6·54	6·56	6·49	6·54	6·39	6·32	6·59	6·48